AVIATION TERMINAL FORECASTS

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Appendices (continued):

1. Purpose. This chapter describes the preparation, by designated National Weather Service (NWS) offices, of aviation terminal forecasts, which may be referred to as terminal or aerodrome forecasts. Terminal forecasts are scheduled to be issued every six hours and are valid for a 24-hour period. Amendments are issued as needed. These forecasts are used by a wide variety of aviation customers, including domestic and international commercial airlines, general aviation, civilian, and military customers. Terminal forecasts serve the pre-flight and in-flight meteorological service requirements of aviation operations by providing a forecast of weather conditions at an airport. It is the policy of the United States that, to the extent practicable, terminal forecasts shall be prepared, issued, and distributed on a timely basis to meet requirements of the United States Aviation Authority, the Federal Aviation Administration (FAA), and the International Civil Aviation Organization (ICAO) in a code format designed by the World Meteorological Organization (WMO) for both domestic and international use.

2. Background. Terminal forecasts in the U.S. shall be prepared in the TAF code, FM 51-X Ext. TAF, Aerodrome Forecast, with U.S. modifications. The international standard for the TAF code, FM 51-X Ext. TAF, is included in WMO Manual on Codes, WMO No. 306, Volume I.1, Part A. The U.S. modifications, or national coding practices in WMO terminology, shall be held to a minimum. The procedures and policies described in this chapter reflect the national coding practices of the United States and the NWS.

The U.S., as a WMO Member State, is obligated to advise the WMO of national coding practices adopted by the U.S. The WMO Manual on Codes, WMO No. 306, Volume I.1, Part A, is the basic document to which U.S. national coding practices apply.

Similarly, the U.S., as a Contracting State of the ICAO, has agreed to provide service for international civil aviation in accordance with ICAO standards and recommended practices with a proviso for the notification to ICAO, on a compulsory basis, of any differences between U.S. national regulations and practices and ICAO standards and, on a voluntary basis, of any differences between U.S. national regulations and practices and ICAO recommended practices.

ICAO Annex 3, "Meteorological Service for International Air Navigation", is the operating document that prescribes the relevant ICAO standards and recommended practices.

In accordance with WMO TAF code instructions, terminal forecasts shall at least contain information about surface wind, visibility, weather (when appropriate), and clouds or vertical visibility. In addition, NWS-prepared terminal forecasts shall include, on an as-required basis, forecasts of non-convective low-level wind shear.

NOTE: In this chapter, the contraction "TAF" will only be used to refer to the code FM 51-X Ext. TAF. The forecast products themselves are referred to as "terminal forecasts".

3. Unique Terms. The terms defined below are used in this Weather Service Operations Manual (WSOM) chapter to specify the degree of obligation with reference to stated procedures or practices.

"SHALL" -- means that a procedure or practice is mandatory;

"SHOULD" -- means that a procedure or practice is recommended;

"MAY" or "NEED NOT" -- means that a procedure or practice is optional; and

"WILL" -- means futurity, not a requirement to be applied to a procedure or practice.

4. Responsibility. Aviation terminal forecasts shall be prepared by designated NWS offices for the airports listed in Appendix A (list of terminal forecasts sorted by NWS-issuing office) and Appendix B (list of terminal forecasts sorted by state). These Appendices include the 4-letter location identifier of the airport, the city or town in which the airport is located, and name of the airport for which terminal forecasts are prepared. Appendices A and B also designate terminal forecasts required only for domestic operations and those required for both international and domestic operations.

NWS offices assuming additional (new) terminal forecast responsibility shall be designated by Regional Operations Manual Letters (ROMLs).

Terminal forecasts are a critical element of NWS aviation weather services. Forecasters shall monitor these products and their preparation using the best professional judgement to optimize terminal forecast timeliness and representativeness.

Regional Aviation Meteorologists (RAMs), or their equivalent in regions without a RAM staff position; Weather Service Evaluations Officers (WSEOs); Warning Coordination Meteorologists (WCMs) and/or any meteorologist designated by the Meteorologist-in-Charge (MIC) shall regularly review terminal forecasts for compliance with these instructions.

NWS offices preparing terminal forecasts should maintain an awareness of how well terminal forecasts are verifying and should ensure that necessary amendments and corrections are issued promptly.

5. Requests for Preparation of New Terminal Forecasts or for Expanding Existing Part-Time Terminal Forecast Services. Requests by the FAA to establish new terminal forecast service or to expand the hours of existing part-time terminal forecast service, stating the validated requirement, should be sent to the appropriate RAM (or equivalent) for evaluation. The NWS region shall recommend the FAA request be approved or disapproved based on availability of data (refer to Section 5.1) and NWS resources to support the newly requested terminal forecast(s). The regional recommendation shall be forwarded to the Chief, Integrated Hydrometeorological Services Core of the NWS' Office of Meteorology.

At locations where part-time manual observations are replaced with 24-hour automated observations, part-time terminal forecast service is not automatically increased to 24 hours. Any increased terminal forecast service must be requested by the FAA and evaluated by the NWS based on availability of data and NWS resources.

Requests by local aviation interests, airlines, *or any source other than the FAA*, to establish new terminal forecast service or to expand the hours of existing part-time terminal forecast service shall be forwarded by the receiving NWS office to the appropriate NWS regional headquarters. The NWS regional office shall forward the request to the appropriate FAA regional office.

Upon NWS Headquarters approval, the NWS Region responsible for the requested terminal forecast shall respond to the appropriate FAA regional office to notify them if the request was approved or disapproved. If the request for a new terminal forecast(s) is approved, the responsible NWS Region shall also initiate and submit a Data Review Group (DRG) Request for Change to add the terminal forecast to the appropriate NWS communication systems. Once the DRG has approved the request, the DRG shall arrange for the product(s) to be added to the appropriate NWS communication

systems, the FAA's Weather Message Switching Center Replacement (or its replacement), the Family of Services, and other appropriate federal data communications systems. The requesting FAA region should be advised that the new terminal forecast service will not begin until it has confirmed arrangements that the FAA communications system can accommodate the product.

5.1 Availability of Observations Required to Initiate New Terminal Forecast Service. As part of the procedures to establish a terminal forecast for an airport where the NWS is not currently preparing one, airport operators shall, at a minimum, ensure regular hourly and special observations of the following weather elements:

wind velocity (speed and direction)
visibility
weather and obscurations
sky condition
temperature
dew point temperature
altimeter setting

Absence of any one of the elements listed above from either the observation itself or supplementary and/or complementary data sources on a regular basis shall preclude the NWS agreement to initiate new terminal forecast service for that location.

Commissioned automated surface observation sites providing Automated Surface Observing System (ASOS) or Automated Weather Observing System (AWOS)-3-type observations (see FAA document 7900.5A, Surface Weather Observing - METAR, Chapters 4 and 5) and meeting either of the following conditions, shall be eligible for terminal forecast service:

a. Attended or unattended automated surface observation sites with systems that meet or exceed the performance specifications of the ASOS, **and** which the MIC of the office that would issue the associated terminal forecast determines have sufficient supplementary, complementary and/or augmented observation data coverage and availability.

b. Automated surface observation sites, with systems that meet or exceed FAA-specified AWOS-3 performance requirements, **and** that the MIC of the office that would issue the associated terminal forecast determines have sufficient supplementary and complementary observation data coverage and availability and/or that have appropriate manual augmentation by certified observers. Appropriate manual augmentation is defined as that which adds, as a minimum, those elements provided by commissioned ASOS systems that are not otherwise available from an AWOS-3.

Augmentation shall be provided in accordance with the agency agreements with augmenters (refer to FAA document 7900.5A, Surface Weather Observing - METAR, Chapters 4 and 5). If the elements listed above are reliably provided, it is NWS policy that the total available data, including those from remote sensor systems such as satellite, radar, profilers, etc., shall be sufficient to support initiation of new terminal forecast service for that airport, and to support preparation and maintenance of a terminal forecast issued under the procedures, including amendment procedures, detailed in this chapter.

6. Forecast Preparation. An NWS terminal forecast shall consist of a **concise** statement of the expected meteorological conditions significant to aviation at an airport during a specified time period. The U.S. definition of an airport is the area within 5 statute miles of the center of an airport’s runway complex.

In the interest of aviation safety, NWS-prepared terminal forecasts shall also include specified critical meteorological phenomena expected to occur in the airport’s vicinity (VC) during any part of the valid period. In the United States, "vicinity" is defined as an area (a donut) between circles with radii of 5 and 10 statute miles from the center of the runway complex of an airport. Refer to Section 7.2.6.a for more information regarding vicinity.

A complete aviation terminal forecast shall include a forecast of surface wind, visibility, weather and clouds (or vertical visibility into a surface-based obscuration) and any expected significant change(s) to one or more of these elements during the specified time period, which shall ordinarily be 24 hours. Under some circumstances, however, a terminal forecast may be issued for a shorter valid period. For example, if essential observational data are not available at the time of scheduled forecast preparation, a forecast issuance may be delayed, (refer to Section 8.2) resulting in a valid period of less than 24 hours.

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The intent of the terminal forecast program is to provide products reflecting the forecaster's best judgement, with an awareness of the potential operational impact of each forecast element.

Automated systems are limited in the range of cloud and visibility values reported and in the weather and obscurations that they can currently report. Terminal forecasts for sites with automated systems shall contain the element value(s) and the type(s) and intensity of weather and/or obscurations that the **forecaster expects**, regardless of whether the automated system can report or differentiate between those conditions and other, similar conditions.

For example, if the forecaster expects clouds above 12,000 feet, zero visibility, ice pellets, or snow showers, the terminal forecast should reflect that. Even when an automated system reports CLR (which indicates "clear below 12,000 feet above ground level (AGL)"), M1/4SM (which indicates visibility of less than one-quarter statute mile), or rain or snow when ice pellets or snow showers may be occurring, the terminal forecast shall be representative of what is **expected to occur**, not just what is expected to be reported by an automated system.

The forecaster shall maintain a watch of weather conditions for all pertinent terminal forecast sites, including sites with scheduled part-time observation (see Section 6.1.1), automated observing sites requiring part-time augmentation (see Section 6.1.2), and unaugmented automated observing sites (see Section 6.1.3).

Forecasters shall use the procedures detailed in this chapter and related Operations Manual Letters (OMLs) and ROMLs to prepare and maintain terminal forecasts that reflect existing or expected weather conditions as accurately and concisely as possible. Amendments (refer to Section 8.1) are an effective method of optimizing the quality of the terminal forecast service and are strongly encouraged.

Forecaster judgement shall be used to resolve situations not addressed by following the guidelines in this chapter and related OMLs and ROMLs.

Refer to Appendix C for an overview of the philosophy behind preparing terminal forecasts. In addition, Appendix D briefly summarizes the terminal forecast issuance guidelines for scheduled, amended, delayed, and suspended terminal forecasts.

6.1 Minimum Observational Requirements for Routine Terminal Forecast Issuance and Continuation. The aviation forecaster must have certain information for the preparation of each scheduled issuance of each individual terminal forecast listed in Appendices A and B. As a minimum, observations, or other complementary and/or supplementary data sources, must include the following elements:

wind velocity (speed and direction)
visibility
weather and obscurations
sky condition
temperature
dew point temperature
altimeter setting

Terminal forecasts should be prepared by integrating many observed data types and sources, guidance material, and forecaster experience. The hourly and special observations are only one of the many data sources from which the elements listed above can be obtained. Alternative methods of obtaining the required elements should be utilized, at the discretion of the forecaster, in order to continue providing terminal forecasts. For example, if the hygrothermometer at an observing site for which a terminal forecast is prepared becomes inoperative, a sling psychrometer may be used to gather the temperature and dew point data required to continue terminal forecast service. No **single** element listed above is necessarily critical to any given terminal forecast.

Note that all of these weather elements need not be provided completely and/or at all times in the hourly/special observation itself. Forecasters shall also make use of supplementary, complementary and/or augmented observational data, as well as other observing systems, such as satellite, Doppler radar, profiler data, etc., in preparing and monitoring terminal forecasts. This approach, to issue and maintain terminal forecasts using multiple, integrated data sets in addition to the hourly and special observations, is known as the **total observation concept**.

Forecasters shall use the total observation concept to maintain the terminal forecast when one or more elements are missing from the METAR observation(s), as well as when an entire observation is missing. **After analyzing available data sets, if, in the forecaster's judgement, a missing observation or a missing element will have no impact on the quality of the terminal**

forecast, the terminal forecast shall be issued and continued. Conversely, in the event the forecaster believes the absence of an observed element(s) will lead to a degradation of the quality of the forecast, the forecast shall be limited (e.g., NIL AMD, indicating no amendments will be provided) or suspended (NIL).

Once a particular terminal forecast has been suspended (NIL), a delayed or scheduled terminal forecast for that airport shall not be issued until two consecutive observations not less than 30 minutes nor more than one hour apart have been received, in order to establish a trend. The two observations must be consecutive and must be not less than 30 minutes nor more than one hour apart. The observations can be two consecutive hourly observations or any two or more observations over approximately a half-hour interval (hourly and special or two specials). This is a daily requirement for sites with part-time manual, or part-time augmented automated, observations.

6.1.1 Sites With Scheduled Part-Time Observations. For terminal forecasts with less than 24-hour observational coverage, or for which part-time terminal forecasts are provided, the terminal forecast shall be valid to the end of the routine scheduled forecast period even if observations have ceased prior to that time. The time observations are scheduled to end and/or resume shall be indicated by expanding the "AMD NOT SKED" statement. Expanded statements shall include the observation ending time (AFT __Z), the scheduled observation resumption time (TIL __Z) or the period of observation unavailability (__Z-__Z). "TIL" should be used only when the beginning of the scheduled terminal forecast valid period coincides with the time of the last observation or when observations are scheduled to resume prior to the next scheduled issuance time. The period should be stated if known and judged reliable. When used, these phrases shall immediately follow the last forecast group. If a routine forecast issuance is scheduled to be made after observations have ceased, but before observations are resumed, the contraction "NIL" followed by the end of report separator shall immediately follow the valid period group of the scheduled issuance. After two consecutive observations have been received, giving the forecaster a reasonable indication of the meteorological trend, and the forecaster judges that the terminal forecast can be resumed based on availability of all the required elements using the total observation concept (see Section 6.1), a delayed forecast shall be prepared and transmitted. The delayed forecast shall be identified in the abbreviated WMO header by the indicator "RRx" (where x = A-X) (see Sections 7.1 and 8.2).

Examples:

```
TAF AMD
KACV 141410Z 141412 text NIL=

TAF AMD
KRWF 150202Z 150224 text AMD NOT SKED 05Z-18Z=

TAF AMD
KPSP 190230Z 190324 text
      NIL AMD=

TAF
KRWI 141610Z 141612 NIL=
```

6.1.2 Automated Observing Sites Requiring Part-Time Augmentation. Each NWS office with terminal forecast responsibility should acquire and maintain a current copy of the FAA document 7900.5A, Surface Weather Observing - METAR. Chapter 4 of that document is entitled "General Procedures at Automated Weather Stations" and Chapter 5 is entitled "Augmentation at Automated Weather Stations".

Terminal forecasts for **non-ASOS** automated observing sites which have part-time augmentation, shall be prepared using the procedures for part-time manual observation sites detailed in Section 6.1.1, with one exception. This exception is the remark to be used when the automated system is unattended. Specifically, the time that an augmented automated system is scheduled to go into unattended operation and/or the time augmentation will resume shall be included in a remark unique to automated observing sites: "AMD LTD TO CLD VIS AND WIND (AFT aaZ, or TIL bbZ, or aaZ-bbZ)", where "aaZ" is the time of the last augmented observation and "bbZ" is the time the second complete observation is expected to be received. This remark, which does not preclude amendments for other forecast elements, shall be appended to the last scheduled terminal forecast issued prior to the last augmented observation. It shall also be appended to all subsequent amendments until augmentation resumes.

The "AMD LTD TO (elements specified)" remark is a flag for customers and differs from the "AMD NOT SKED AFT __Z" remark for part-time manual observation sites. "AMD LTD TO (elements specified)" means that customers should not expect amendments due to changes in the thunderstorm forecast elements or the freezing/frozen precipitation elements (for example) after the specified time. It also means that some reliable information is available and will be used to support terminal forecast services.

Example:

TAF AMD
KCOE 150202Z 150224 text AMD LTD TO CLD VIS AND WIND
05Z-18Z=

Amended TAF for Coeur D'Alene Air Terminal, issued on the 15th day of the month at 0202 UTC. It amends a previous terminal forecast valid from 0000 UTC on the 15th until 0000 UTC on the next day (the 16th). The amended forecast indicates that, between 0500 and 1800 UTC, amendments will only be issued for wind, visibility, and clouds.

Non-ASOS automated systems with part-time augmentation, which the forecaster suspects are providing unreliable information when unaugmented, should be reported for maintenance and treated the same as part-time manual observation sites (see Section 6.1.1). In such cases, the "AMD NOT SKED AFT __Z" remark shall be used.

When an amendment is necessary, it shall include forecasts for all appropriate terminal forecast elements, including those not reported when the associated automated observation is unaugmented. Forecasters should use their best judgement and all available information to determine unreported elements such as present weather. If unreported elements are judged crucial to the representativeness of a terminal forecast and cannot be adequately determined (e.g., fog versus moderate snow), the terminal forecast should be suspended (i.e. issue an amended terminal forecast stating "NIL").

6.1.3 Unaugmented Automated Observing Sites. The terminal forecast issued for an **unaugmented ASOS** site may be suspended in the event the forecaster is notified of, or strongly suspects, an outage. Forecasters may also consider suspension of terminal forecast service when an element the forecaster judges to be critical is missing from the observation and cannot be obtained using the total observation concept. The term "NIL AMD", indicating no amendments will be provided, shall be appended, on a separate line and indented five spaces, to the end of an amendment to the existing terminal forecast when appropriate. If the outage occurs within one hour of the next scheduled issuance or if the forecaster begins to suspect that the existing terminal forecast is unrepresentative of conditions, an amendment or scheduled issuance containing only the statement "NIL" shall be issued.

6.2 Guidance and Coordination. Forecasters should utilize available guidance products from the National Centers for Environmental Prediction (NCEP), the Aviation Weather Center (AWC), the Alaska Aviation Weather Unit (AAWU), the Storm

Prediction Center (SPC), the Tropical Prediction Center, the Central Pacific Hurricane Center, the Techniques Development Laboratory, and other sources, as appropriate. However, the detail demanded in the terminal forecast and the influence of local effects require the use of the forecaster's judgement, experience, and expertise to prepare this highly definitive mesoscale forecast. **The forecaster is the final authority, and is ultimately responsible for the forecasts he or she issues.**

Forecasters should coordinate with adjacent NWS offices to prevent inconsistencies between forecasts. Terminal forecasts should be synoptically consistent with public and other aviation products. However, since the terminal forecast describes conditions in a very small area, as compared to public zone forecasts or sections of an aviation area forecast, some small-scale differences may occur. Routine coordination procedures should ensure that public and aviation forecasts issued by adjacent offices are synoptically consistent. MICs are ultimately responsible for ensuring consistent, accurate, well-written forecasts.

When appropriate, NWS offices should call local FAA facilities and/or Center Weather Service Units (CWSU) to solicit pilot reports (PIREPs). PIREPs provide additional information on operationally significant ceilings, non-convective low-level wind shear, etc. CWSU forecasters should relay PIREPs of conditions pertinent to the terminal forecast, as well as other PIREP information as duties permit, to appropriate NWS offices.

6.3 Time References. The times in terminal forecasts shall be stated in Coordinated Universal Time (UTC). Time references should be as detailed and specific as supporting data and forecaster knowledge allow. The letter "Z" is appended to the end of the date-time group of forecast origin (refer to Section 7.2.2). The contraction UTC does not appear in the WMO abbreviated heading (see Section 7.1) nor the forecast text (see Section 7.2).

6.4 Contractions. The only contractions to be used in NWS terminal forecasts shall be those terms defined in this manual chapter, which have been derived from the WMO Codes Manual and from the ICAO document "ICAO Abbreviations and Codes". In a very few cases, plain language English terms may be used. All valid contractions applicable to terminal forecasts are included in Appendix E.

6.5 Dissemination and Format. All scheduled and unscheduled terminal forecasts shall be disseminated via long-line circuits. Terminal forecasts prepared by NWS offices in the contiguous United States (CONUS) and Puerto Rico are transmitted internally on NWS communication systems such as Automation of Field Operations and Services (AFOS) as individual products, i.e., one terminal forecast per communication header. The NWS Telecommunication Gateway (NWSTG), which is responsible for the domestic and international distribution of terminal forecasts, assembles all terminal forecasts prepared by NWS offices in the CONUS and Puerto Rico into collectives for domestic and international distribution. Terminal forecasts prepared by NWS offices in Alaska and Pacific Regions are transmitted to the NWSTG in collectives, i.e., several forecasts per communication header. Individual NWS offices shall conform to the regulations of the NWS region managing the network on which the forecasts originate (i.e., AFOS, Alaska Region Operations Network [ARONET], etc.).

The first line of the text of a terminal forecast product shall consist solely of "TAF" or "TAF AMD" (see Section 7.2). The contraction TAF (or TAF AMD) is stated only once in each product, whether it contains one or more terminal forecasts. The next line begins with the ICAO 4-letter location identifier at the left margin. Any subsequent FMGGgg group(s) (refer to Section 7.2.9.a) shall begin on a new line(s), indented **five** spaces. Continuation line(s) of a forecast group shall be indented **six** spaces.

When an office transmits more than one terminal forecast in a single collective, each forecast shall be started on the line immediately following the previous terminal forecast with the location identifier at the left margin. Each complete terminal forecast shall be followed by an end-of-report separator (an equal sign [=]) to denote the end of a complete terminal forecast for each location. The end-of-report separator shall be followed by two carriage returns and a line feed.

The **length of a line shall not exceed 69 spaces**, including typed characters, spaces, carriage returns, line feeds, and the end-of-report separator.

6.6 Issuance Times. Scheduled terminal forecasts prepared by NWS offices are issued four times a day, every six hours, according to the following schedule:

SCHEDULED ISSUANCE	VALID PERIOD	ISSUANCE WINDOW
0000 UTC	0000 to 0000 UTC	2320 to 2340 UTC
0600 UTC	0600 to 0600 UTC	0520 to 0540 UTC
1200 UTC	1200 to 1200 UTC	1120 to 1140 UTC
1800 UTC	1800 to 1800 UTC	1720 to 1740 UTC

A **scheduled** terminal forecast is always issued prior to the beginning of the valid period of the forecast. Routine terminal forecast issuances should be completed by the forecaster and transmitted 20 to 40 minutes before the beginning of the forecast valid period, e.g., no later than 0540 UTC for a terminal forecast valid from 0600 to 0600 UTC. Forecasters are encouraged to transmit terminal forecasts at the beginning of the issuance window whenever possible, to facilitate timely delivery of the forecasts to our customers and to ease communication loading at the end of the issuance window.

Each office with terminal forecast responsibility is required to issue four scheduled terminal forecasts per day, even if one (or more) of the scheduled terminal forecasts are suspended ("NIL"). Following a "NIL" terminal forecast, a delayed forecast (see Section 8.2) or scheduled forecast shall be issued as soon as possible, based on forecaster judgement.

6.7 Sub-dividing the Terminal Forecast Valid Time Period. The valid time period of the terminal forecast may be sub-divided into one or more smaller segments of time to describe significant changes to the forecast conditions during the period. The terms used to sub-divide the valid time period are described in Section 7.2.9.

Terminal forecasts should be as simple and straightforward as possible. Changes indicated in the forecast should be kept to the minimum number needed to describe operationally significant changes. Weather conditions and elements to be considered **significant** in decisions regarding sub-dividing the forecast valid period and the utility for forecast amendments include the following:

6.7.1 Flight Category Changes. The Low Instrument Flight Rules (LIFR), Instrument Flight Rules (IFR), Marginal Visual Flight Rules (MVFR), and Visual Flight Rules (VFR) flight categories define sets of operating procedures, aviator qualifications and aircraft capability requirements. Forecasters shall be familiar with these flight categories. Changes or expected changes in ceiling and/or visibility that cross a flight category threshold are operationally significant. Changes in these flight categories could mean a flight cancellation or could necessitate carrying extra fuel.

The flight categories and corresponding ceiling and visibility values are listed below.

FLIGHT CATEGORY	**CEILING (feet)**		**VISIBILITY (statute miles)**
LIFR	< 500 ft	and/or	< 1SM
IFR	≥ 500 to < 1,000	and/or	≥ 1 to < 3SM
MVFR	≥ 1,000 to ≤ 3,000	and/or	≥ 3 to ≤ 5SM
VFR	> 3,000 ft or none	and	> 5SM

NOTE: IFR is alternatively defined as including LIFR meteorological conditions.

6.7.2 Element Value Changes. Other element thresholds and/or events that have operational impact, i.e., significant safety, capacity, and/or efficiency impact on aviation operations, include:

CEILING AND/OR VISIBILITY THRESHOLDS WITHIN A FLIGHT CATEGORY:

CEILING AND/OR VISIBILITY THRESHOLDS	**OPERATIONAL IMPACT**
< 2,000 ft and/or < 3 mi	Alternate destination and increased fuel required for IFR planning. May restrict visual approaches reducing airport arrival rates.
< 800 ft and/or < 2 miles	Non-precision-approach airports cannot be used as an IFR flight planning alternate.
< 600 ft and/or < 2 miles	Airport cannot be used by most operators as an IFR flight planning alternate.
< 200 ft and/or < 1/2 mi	These forecast conditions would preclude dispatch/release to the airport as a destination or alternate for most operators. Operators approved for approach Category II/III could dispatch as a destination airport.

EVENTS THAT HAVE SIGNIFICANT OPERATIONAL IMPACT:

Onset or ending of:	thunderstorms, non-convective low-level wind shear, freezing precipitation, ice pellets, moderate or greater rain, snow expected to accumulate, or sustained winds greater than 15 knots
Occurrence of:	wind direction changes of 30 degrees or more when speeds are 12 knots or more or wind gust value changes of 10 knots or more

7. Terminal Forecast Coding. Each group of the TAF code which is used in NWS-prepared terminal forecasts is described in the following sections. Each section includes partial or complete examples of one or more terminal forecasts to clarify descriptions in the text.

7.1 Bulletin Headings. Terminal forecast bulletins begin with a WMO abbreviated heading or an AFOS Product Inventory List (PIL) which includes a "dummy" WMO abbreviated heading. For example:

WMO Header	AFOS PIL and "dummy" WMO heading
FTUS31 KMIA 011700 (BBB)	MIATAFMLB
TTAA00 KMIA 011700 (BBB)	

"FT" identifies this as a terminal forecast with a valid period exceeding 12 hours; "US" identifies this as a terminal forecast issued for an airport in one of the 48 contiguous states. "KMIA" is the ICAO location identifier of the office that issued the terminal forecast. ICAO location identifiers in the CONUS begin with the letter "K". Location identifiers in the North Pacific (that is, in Hawaii, Alaska, and Guam) all begin with the letter "P". Location identifiers in the Caribbean (such as Puerto Rico and the Virgin Islands) begin with a "T". Location identifiers for stations in the South Pacific begin with an "N".

The group "011700" is the date/time group in the WMO abbreviated heading. The first two digits indicate the day of the month that the forecast was transmitted. This bulletin was transmitted on the first day of the month. For a scheduled terminal forecast, the international requirement is for the last four digits to indicate the time of the **full hour**, in UTC, preceding the transmission time. **To meet the international requirement, the minutes shall be "00" for a scheduled terminal forecast whenever possible**.

Due to a software limitation, scheduled terminal forecasts prepared at NWS AFOS offices using personal computers and sending the forecasts asynchronously to AFOS for transmission need not reflect the full hour (i.e., minutes "00"), but may reflect the actual time, in hours and minutes, the scheduled terminal forecast was transmitted over AFOS. **Forecasters at offices using AFOS are not required to manually override the "time-stamp" automatically assigned to it by the AFOS software when preparing scheduled terminal forecasts.** Those terminal forecasts are collected into bulletins at the NWSTG, and the NWSTG-generated collective will correctly reflect the full hour (i.e. minutes "00") in the WMO abbreviated heading for the appropriate collective. The sample bulletin shown above was transmitted after 1700 UTC but before 1800 UTC on the first day of the month.

"(BBB)" is the indicator which shall be used if it becomes necessary to use the same WMO abbreviated heading more than once. The indicator BBB shall be used for corrections, delayed transmissions, and amendments. The "BBB" group is omitted if not required. The indicators used are:

AAx	for amendments to previously transmitted forecast(s)
RRx	for delayed routine forecast(s)
CCx	for corrections of previously transmitted forecast(s)

where x is the letter A through X, used sequentially, indicating the subsequent use of the heading. For example, the first correction would be CCA, the second CCB, etc.

Refer to Sections 8.1 through 8.3.1 for more information and examples of the use of the "BBB" group in amended, delayed, and corrected terminal forecasts.

In the AFOS PIL example above, the "MIA" is the node identifier (CCC); "TAF" is product category (NNN); "MLB" (XXX) identifies the airport to which the terminal forecast applies; and "TTAA00" is the WMO header placement holder or "dummy" WMO header. For terminal forecasts prepared at offices with AFOS equipment, the "dummy" WMO header (TTAA00 Kxxx DDHHMM) is overwritten by the actual WMO header at the NWSTG. The remaining AFOS characters are the same as in the WMO header.

7.2 Forecast Text. The first line of the forecast text of a terminal forecast consists of the contraction "TAF" or "TAF AMD", which indicates whether the forecast contained in the product is scheduled or amended, respectively. This information appears only once, on a line by itself, at the beginning of the product, whether it contains one or more terminal forecasts. **Corrected and delayed forecasts are not identified in the forecast text; that information is included only in the WMO abbreviated header**.

The generic format of the forecast text of an NWS-prepared terminal forecast is made up of code groups, as shown below. Each generic term and group shown below is presented and described in Sections 7.2.1 through 7.2.9 of this chapter in the same order as they are to be entered in each forecast group.

GENERIC FORMAT OF THE FORECAST TEXT OF AN NWS-PREPARED TERMINAL FORECAST

{**TAF**
{or
{**TAF AMD**

CCCC	**YYGGggZ**	**$Y_1Y_1G_1G_1G_2G_2$**	**dddffGf_mf_mKT**
(location identifier)	*(date-time of forecast origin)*	*(valid period)*	*(wind forecast)*

{**VVVV**	{**w'w'** {or {**NSW**	{**$N_sN_sN_sh_sh_sh_s$** {or {**VV$h_sh_sh_s$** {or {**SKC**
(visibility forecast)	*(significant weather forecast)*	*(cloud and obscuration forecast)*

WS$h_{ws}h_{ws}h_{ws}$/dddffKT

(non-convective low-level wind shear forecast)

{**TTGGgg**
{or
{**TTTTT GGG$_e$G$_e$**

PROBC$_2$C$_2$ GGG$_e$G$_e$

(forecast change indicators)

(probability forecast)

For completeness, the entire international TAF code format (of which the NWS TAF format is a subset) of the text of a terminal forecast is shown in Appendix F. In addition, Appendix G includes explanations of international terms and groups not used in NWS terminal forecasts. This information is available to aid in reading terminal forecasts from other government agencies within the U.S. and other countries.

7.2.1 Location Identifier (CCCC). Following the line containing the contraction TAF or TAF AMD, each terminal forecast shall begin with its four-letter ICAO location identifier. A complete list of these identifiers is given in ICAO Document 7910, Location Indicators.

For NWS offices who transmit terminal forecasts in a bulletin (collective), the order in which terminal forecasts are placed should be decided upon by the region or NWS office concerned and remain unchanged insofar as possible. Newly added airports should generally be placed at the end of the bulletin. Location identifiers remaining after a deletion from the bulletin should occupy the same relative order as before the deletion.

7.2.2 Date-Time of Forecast Origin Group (YYGGggZ). The date-time of forecast origin group (YYGGggZ) follows the terminal's location identifier. It states the date (2-digit date of the month, based on UTC time) and time (2-digit hour and 2-digit minute, based on UTC time) the forecast is completed and ready for transmission. This time is entered by the forecaster, immediately before transmitting the forecast. Refer to Section 6.6 for a table of the issuance time windows for scheduled terminal forecasts. The letter "Z" is appended at the end of the date-time of forecast origin group.

Examples:

```
WBCTAFIAD
TTAA00 KWBC 010500
TAF
KIAD 010525Z 010606 etc.=
```

Scheduled terminal forecast for Washington Dulles International Airport, issued on the 1st day of the month at 0525 UTC, and valid from 0600 UTC on the 1st until 0600 UTC the next day (the 2nd)

```
NYCTAFJFK
TTAA00 KNYC 192300
TAF
KJFK 192335Z 200024 etc.=
```

Scheduled terminal forecast for John F. Kennedy International Airport, issued on the 19th day of the month at 2335 UTC, and valid from 0000 UTC on the 20th until 0000 UTC the next day (the 21st)

7.2.3 Valid Period ($Y_1Y_1G_1G_1G_2G_2$) and Routine Issuances. The forecast valid period ($Y_1Y_1G_1G_1G_2G_2$) immediately follows the date-time group of forecast origin. Scheduled terminal forecasts are issued four times per day, and are valid for 24 hours, beginning at 0000, 0600, 1200, and 1800 UTC. Refer to the table shown in Section 6.6 for issuance times for scheduled terminal forecasts. The first two digits of the valid period group (Y_1Y_1) represent the date of the month of the beginning of the valid period, based on UTC time. The second two digits (G_1G_1) of the valid period indicate the beginning valid time (two-digit hour) in UTC. The last two digits (G_2G_2) indicate the ending valid time (two-digit hour) in UTC. The time of a forecast period *beginning* at midnight UTC shall be indicated as 00. The time of a forecast period *ending* at midnight UTC shall be indicated as 24.

Examples:

```
CAETAFCHS
TTAA00 KCHS 020500
TAF
KCHS 020530Z 020606 text TEMPO 1824 (not "TEMPO 1800") etc.=
```

Scheduled terminal forecast for Charleston AFB/International Airport, issued on the 2nd day of the month at 0530 UTC, and valid from 0600 UTC on the 2nd until 0600 UTC the next day (the 3rd). Then, later in the forecast period, temporary conditions are expected between 1800 UTC on the 2nd and 0000 UTC the next day (the 3rd).

```
PWMTAFBGR
TTAA00 KPWM 161700
TAF
KBGR 161740Z 161818 text BECMG 0002 (not "BECMG 2402") etc.=
```

Scheduled terminal forecast for Bangor International Airport, issued on the 16th day of the month at 1740 UTC, and valid from 1800 UTC on the 16th until 1800 UTC the next day (the 17th). Then, later in the forecast period, a change in at least one of the prevailing conditions is expected between 0000 UTC the next day (the 17th) and 0200 UTC the 17th.

```
SJUTAFSJU
TTAA00 KSJU 272300
TAF
TJSJ 272333Z 280024 (not "280000" nor "282424") etc.=
```

Scheduled terminal forecast for Luis Muñoz Marin International Airport, issued on the 27th day of the month at 2333 UTC, and valid from 0000 UTC on the 28th until 0000 UTC the next day (the 29th).

7.2.4 Wind Group (dddffGf$_m$f$_m$KT). The initial time period and any subsequent FM group(s) shall include a *mean surface wind forecast* (dddffGf$_m$f$_m$KT) for the period, as described below. Forecasts of wind shall be expressed as the mean three-digit direction, relative to true north, to the nearest multiple of ten degrees and the mean wind speed in knots for the time period. Wind gusts are forecast when rapid fluctuations in wind speeds with a variation of 10 knots or more between peaks and lulls are expected. Gusts are indicated immediately after the mean wind speed by the letter "G", followed by the *peak* gust speed expected during the time period. The contraction for knots, KT, is appended to the end of the wind forecast group.

Wind speeds expected to be calm shall be encoded as 00000KT. Wind direction from due north is encoded as 360. Wind speeds of 100 knots or more, including gusts, shall be encoded using three digits.

The expected prevailing wind direction shall be forecast. When it is not possible to forecast a prevailing surface wind direction due to its expected variability (variations in wind direction of 180 degrees or more), as may be the case for very light wind conditions (**3 knots or less**) or during convective activity, the forecast wind direction shall be encoded as VRBffKT. Variable wind direction implies a wind speed greater than zero. It is incorrect to encode VRB00KT. The contraction VRB shall not be used in the non-convective low-level wind shear group (refer to Section 7.2.8).

Forecaster judgement determines whether to forecast either a mean or variable wind direction with low wind speeds, keeping in mind that the customer needs our best estimate. Also note that there are no amendment criteria (see Appendix H) for these low wind speed conditions.

There is no option for specifying the range of wind direction when variable wind direction is forecast (i.e., 360V080 shall not be included in a terminal forecast).

Forecasters are encouraged to include a wind forecast in any sub-divided time period which includes thunderstorms.

Squalls are not forecast in the wind group; forecast squalls shall be included in the significant weather group (see Section 7.2.6). There is no means to encode the speed of squalls in the terminal forecast.

Examples:

```
TAF
KEVV 231732Z 231818 23010KT 4SM -SHRA BKN030
     FM2130 28020G35KT P6SM OVC020
     FM0000 30015G35KT P6SM SCT060 TEMPO 0104 BKN060
     FM0500 30012KT P6SM SCT080=
```

This scheduled terminal forecast, for Evansville Regional Airport, demonstrates rapid changes in wind associated with a frontal passage. This example also shows the correct format for gusts.

```
TAF
KGRB 241732Z 241818 11006KT 4SM -SHRA BKN030
     BECMG 2324 22006KT PROB30 0002 VRB20KT 1SM +TSRA
      BKN015CB=
```

Scheduled terminal forecast for Austin Strauble International Airport, issued on the 24th day of the month at 1732 UTC, and valid from 1800 UTC on the 24th until 1800 UTC the next day (the 25th): Winds from 110 degrees at 6 knots, visibility 4 statute miles in light rain showers, and broken clouds (ceiling) at 3,000 feet. Winds will change between 2300 and 0000 UTC to be from 220 degrees at 6 knots; the other meteorological elements (visibility, significant weather, and clouds) remain as forecast in the initial time period (first set of prevailing conditions). Between 0000 and 0200 UTC, 30 percent chance of variable wind direction (due to convection) at 20 knots, visibility 1 statute mile in thunderstorms with heavy rain, and broken clouds (ceiling) at 1500 feet, including cumulonimbus.

```
TAF
KCSG 060537Z 060606 VRB03KT etc.=
```

This scheduled terminal forecast for Columbus Metropolitan Airport shows the correct format and use of variable wind direction (here due to light wind speed): at the beginning of the valid period (0600 UTC), wind direction is forecast to be variable at 3 knots.

```
TAF
KROW 021726Z 021818 30008KT 5SM HZ BKN030 PROB40 0002
      VRB20G45KT 1SM TSRA OVC012CB etc.=
```

This scheduled terminal forecast for the Roswell Industrial Air Center shows the correct format and use of variable wind direction (here due to convection): beginning at 1800 UTC, the wind is forecast to be from 300 degrees at 8 knots....then between 0000 UTC and 0200 UTC the next day (the 3rd), there is a 40 percent chance the wind direction will be variable and wind speed 20 knots gusting to 45 knots, in association with forecast thunderstorms.

```
TAF
KAMA 171130Z 171212 00000KT etc.=
```

This scheduled terminal forecast, for the Amarillo International Airport, shows the correct format for calm winds.

Examples (continued):

TAF
PASN 010530Z 010606 080100G140KT etc.=

This scheduled terminal forecast, for St. Paul Island Airport, shows the correct format of wind speed of 100 knots or more: beginning at 0600 UTC the wind is from 80 degrees at 100 knots gusting to 140 knots.

7.2.5 Visibility Group (VVVV). The initial time period and any subsequent FM group(s) shall include a visibility forecast (VVVV), in statute miles. The valid values for forecasting visibility in NWS-prepared terminal forecasts are shown below. Visibility shall be forecast *rounded down* to the nearest reported value. The contraction for statute miles (SM), is appended to the end of the visibility forecast group.

VALID VISIBILITY FORECAST VALUES

STATUTE MILES	METERS
0	0
1/4	0400
1/2	0800
3/4	1200
1	1600
1 1/2	2400
2	3200
3	4800
4	6000[1]
5	8000
6	9000[2]
P6	9999[3]

NOTE: When visibility is reduced to < 5/8 statute miles in fog, it is encoded as FG; visibility ≥ 5/8 statute mile is encoded as BR.

[1] Rounded down from 6400 meters

[2] Rounded down from 9600 meters

[3] Greater than 6 statute miles (10 kilometers and above)

Whenever the prevailing visibility is forecast to be 6 statute miles or less, one or more significant weather groups (see Section 7.2.6) shall be included. In addition, low drifting dust (DRDU), low drifting sand (DRSA), low drifting snow (DRSN), shallow fog (MIFG), partial fog (PRFG), and patchy fog (BCFG) may be forecast with prevailing visibility of 7 statute miles or greater.

When a whole number and a fraction are used to forecast visibility, a space shall always be included between them (e.g., 1 1/2SM). Visibility greater than 6 statute miles shall be encoded as P6SM.

If the visibility is not expected to be the same in different directions, prevailing visibility, as described by Federal Meteorological Handbook No. 1 (FMH-1), shall be used.

When volcanic ash (VA) is forecast in the significant weather group, visibility shall also be included in the forecast, even if the visibility is expected to be unrestricted (P6SM). For example, an expected reduction of visibility to 10 statute miles by volcanic ash shall be encoded in the forecast as P6SM VA.

7.2.6 Significant Weather Group (w'w'). The significant weather group (w'w') consists of the appropriate qualifier(s) and weather phenomenon contraction(s) (shown in Appendix I and described in FMH-1) or the contraction "NSW" ("no significant weather" - see below). Appendix J shows all possible valid combinations of weather phenomena codes and should be used to encode w'w'.

When no significant weather is expected in the initial time period of the terminal forecast or in subsequent FMGGgg groups (refer to Section 7.2.9.a), the group w'w' (including NSW, meaning "no significant weather") shall be *omitted* for that time period. The initial forecast period and subsequent FMGGgg groups shall either contain an explicit significant weather group or the significant weather group shall be omitted. **The contraction NSW shall not be used in the initial forecast time period nor in FMGGgg groups.**

The weather phenomenon code UP (unknown precipitation) listed in Appendix I shall not be used in NWS-prepared terminal forecasts. UP is only used in automated surface observations.

Tornadic activity, including tornadoes, waterspouts, and funnel clouds, should not be forecast in terminal forecasts, because the probability of occurrence at a specific site is extremely small.

The significant weather group, if it is to be included in a terminal forecast, shall be a code group selected from the phenomena listed in Appendix J. One or more significant weather group(s) is (are) required whenever the visibility is forecast to be 6 statute miles or less (see Section 7.2.5). With the exception of volcanic ash (VA), low drifting dust (DRDU), low drifting sand (DRSA), low drifting snow (DRSN), shallow fog (MIFG), partial fog (PRFG), and patchy fog (BCFG), obscurations are forecast only when the prevailing visibility is less than 7 statute miles or considered operationally significant in the judgement of the forecaster.

Volcanic ash (VA) shall always be forecast when expected. When volcanic ash is included in the significant weather group, visibility shall be included in the forecast as well, even if the visibility is unrestricted (P6SM). For example, if volcanic ash is forecast and the visibility is expected to be 10 statute miles, it would be coded "P6SM VA" in the terminal forecast.

The contraction NSW, meaning "no significant weather", shall be used in place of w'w' only in a BECMG or TEMPO group (see Sections 7.2.9.b and 7.2.9.c, respectively) to indicate when significant weather, including weather in the vicinity, e.g. VCSH (refer to Section 7.2.6.a), which had been included in a previous sub-divided group is expected to end.

The term NSW is used only to indicate that previously forecast significant weather (w'w') is expected to end. The use of NSW neither conveys any information about, nor replaces, the cloud and obscuration group or the visibility group.

After NSW is used to forecast significant weather, any subsequent significant weather groups shall either be omitted or selected from the phenomena listed in Appendix I (with clarification by Appendix J). No two consecutive BECMG or TEMPO groups shall contain NSW as the significant weather group.

NOTE: "P6SM NSW" shall be used together in a BECMG or TEMPO group when the significant weather is forecast to end and the visibility is forecast to improve from 6 statute miles or less to greater than 6 statute miles.

Example:

```
TAF
KBOS 050539Z 050606 VRB03KT 5SM SHRA VCFG BKN025
      BECMG 1416 P6SM NSW SCT010 BKN025 etc.=
```

This scheduled terminal forecast, for General Edward Lawrence Logan International Airport in Boston, shows the correct use of NSW to indicate that *both* the rain showers and the fog in the vicinity is forecast to end between 1400 and 1600 UTC.

One exception: when the only significant weather is forecast within the vicinity of the airport and the prevailing visibility is greater than 6 statute miles, then the term NSW is used alone.

Example:

```
TAF
KTUS 101131Z 101212 12015G35KT P6SM VCTS OVC015CB
      BECMG 1415 NSW etc.=
```

This scheduled terminal forecast, for Tuscon International Airport, shows the correct use of NSW to indicate that the thunderstorms in the vicinity are forecast to end between 1400 and 1500 UTC.

In many cases, only one weather phenomenon should be included in any one time period. Forecasters shall use their judgement as to how many weather phenomena groups are included. NWS forecasters may include as many w'w' groups as necessary to convey the expected conditions.

When more than one type of significant weather is forecast in the same forecast time period, significant weather shall be forecast in the following order:

* Thunderstorm(s) with or without associated precipitation
* Significant weather in order of decreasing dominance based on intensity, i.e., the most intense type is reported first (with one exception for precipitation; see the exception below)
* Left-to-right in Appendix I (columns 1 through 5).

Forecaster judgement shall be used to resolve situations not addressed by following the guidelines above.

A w'w' group shall be encoded:

(a) First, if appropriate, the qualifier for intensity or for proximity, followed without a space by:

(b) If appropriate, the contraction for the descriptor followed without a space by:

(c) The contraction for the observed weather phenomenon or combinations thereof.

Multiple precipitation elements are encoded in a single group (e.g., -TSRASN). Non-precipitation significant weather elements are encoded after any precipitation in separate groups, each separated by a space (e.g., -SHSN BLSN BR).

If more than one type of precipitation is forecast, up to three of the appropriate precipitation contractions shall be combined in a single group (with no spaces) with the *predominant type of precipitation being included first*. In such a single group, the intensity shall refer to the total precipitation and be used with one or no intensity qualifier, as appropriate. The intensity qualifiers (light, moderate, and heavy) refer to the intensity of the precipitation and not to the intensity of the thunderstorm.

Exception for encoding multiple precipitation types: When more than one type of precipitation is forecast in a time period, any precipitation type associated with a descriptor (e.g., FZRA) *must* be encoded first in the precipitation group, regardless of the predominance or intensity of the other precipitation types. *Descriptors shall not be encoded in association with the second or third precipitation type in the group.* In such a case, the intensity is associated with the first precipitation type of a multiple precipitation type group. For example, a forecast of heavy snow and light freezing rain is properly coded as -FZRASN, even though the intensity of the snow is greater than that of the freezing rain. The reasoning is that the descriptor (FZ) must be encoded first, and the intensity for the precipitation group is associated with the first precipitation type. In this example, the heavy snow would have to be inferred by a visibility forecast of ≤ 1/4 statute mile.

A qualifier (if relevant) shall precede, without a space, the phenomenon (including the descriptor, if it has one) to which it applies. There are two categories of qualifiers (see Appendix I): intensity/proximity or descriptor. With the exception of VCSH and VCTS, which are used to forecast showers or thunderstorms between 5 and 10 statute miles of the airport, only

one intensity or proximity qualifier and only one descriptor shall be used for each weather phenomena group. The intensity qualifiers are minus (-), indicating light, and plus (+), indicating heavy. No qualifier shall be included in the significant weather group when the intensity of the forecast phenomenon is moderate.

Intensity shall be coded with precipitation types, except ice crystals and hail, including those associated with a thunderstorm (TS) and those of a showery nature (SH). No intensity shall be ascribed to blowing dust (BLDU), blowing sand (BLSA), nor blowing snow (BLSN). Only moderate or heavy intensity shall be ascribed to sandstorm (SS) and duststorm (DS). Refer to FMH-1 for criteria for determining intensity associated with these weather elements. Some intensity criteria are also described in the footnotes of Appendix J.

There is no way to explicitly forecast a severe thunderstorm in the significant weather group of a terminal forecast. However, a severe thunderstorm may be forecast in a terminal forecast on the basis of the strength of the winds (including wind gusts of 50 knots or greater) *and* a thunderstorm in significant weather. There is no significant weather contraction for ≥ 3/4 inch hail, which is the hail criteria for a severe thunderstorm. Refer to Section 9 for more information on severe weather.

Once a significant weather code group has been used, if conditions are forecast to change, the entry for the significant weather group in the next BECMG or TEMPO group (refer to Sections 7.2.9.b and 7.2.9.c, respectively) shall be a different code group or the contraction NSW. If the significant weather group does not differ in the subsequent BECMG or TEMPO group(s), no additional significant weather group is necessary and the most recently forecast significant weather group will apply to these subsequent group(s).

Examples showing combinations of one precipitation and one non-precipitation weather phenomena:

-DZ FG	light drizzle and fog (obscuration which reduces visibility to < 5/8 statute mile)
RA BR	moderate rain and mist (obscuration which reduces visibility to < 7 statute miles but ≥ 5/8 statute miles)
-SHRA FG	light rain showers and fog (visibility < 5/8 statute miles)
+SN FG	heavy snow and fog

Examples showing combinations of more than one type of precipitation:

-RASN FG HZ	light rain and snow (light rain predominant), fog, and haze
TSSNRA	thunderstorm with moderate snow and rain (moderate snow predominant)
FZRASNPE	moderate freezing rain, snow, and ice pellets (freezing rain mentioned first due to the descriptor, followed by other precipitation types in order of predominance)
SHPESN	moderate ice pellet and snow showers

Example:

TAF
KFAR 091739Z 091818 21030G60KT 1/4SM +TSRAGR BKN050CB etc.=

Scheduled terminal forecast for Hector International Airport, issued at 1739 UTC on the 9th day of the month, valid from 1800 UTC on the 9th until 1800 UTC the next day (the 10th): Winds from 210 degrees at 30 knots gusting to 60 knots, visibility 1/4 statute mile in thunderstorms with heavy rain and hail. NOTE: the "+" qualifier is associated with the precipitation (RA) and *not* the thunderstorm ("TS"). Broken cumulonimbus clouds (ceiling) at 5,000 feet.

Thunderstorm (TS) is the only descriptor which may be encoded as a significant weather group without any associated precipitation. TS may be encoded standing alone in a forecast in two situations: 1) when thunderstorm(s) are forecast without associated precipitation, or 2) to indicate thunderstorms with freezing precipitation (drizzle or rain).

Whenever a thunderstorm(s) is included in the significant weather group, even in the vicinity (VCTS), the cloud group ($N_sN_sN_sh_sh_sh_s$) shall include a forecast cloud type of cumulonimbus (CB).

Example:

TAF
KMCI 252335Z 260024 31015KT 1 1/2SM TS -FZRA BKN010CB etc.=

Scheduled terminal forecast for Kansas City International Airport, issued on the 25th day of the month at 2335 UTC, and valid from 0000 UTC on the 26th until 0000 UTC the next day (the 27th): Wind from 310 degrees at 15 knots, visibility 1 1/2 statute miles in thunderstorms and light freezing rain, broken cumulonimbus clouds (ceiling) at 1,000 feet.

A visibility threshold must be met before a forecast for fog (FG) may be included in the terminal forecast. When forecasting a fog-restricted visibility of 5/8SM to 6SM inclusive, the phenomena shall be coded as BR (mist). When forecasting a fog-restricted visibility that is less than 5/8SM, use code FG (fog). Never encode weather/obscuration as mist (BR) when the forecast visibility is greater than 6 statute miles, i.e., P6SM.

The following fog-related terms shall only be used as described below:

freezing fog (FZFG): Any fog (visibility less than 5/8 statute miles) consisting predominantly of water droplets at temperatures *below* 0°C, *whether or not rime ice is expected to be deposited*. FZBR is not a valid significant weather combination and shall not be used in terminal forecasts.

shallow fog (MIFG): the visibility at 6 feet above ground level shall be 5/8 statute miles or more and the apparent visibility in the fog layer shall be less than 5/8 statute miles.

patchy fog (BCFG): fog patches covering part of the airport. The apparent visibility in the fog patch or bank shall be less than 5/8 statute miles, with the foggy patches extending to at least 6 feet above ground level.

partial fog (PRFG): a substantial part of the airport is expected to be covered by fog while the remainder is expected to be clear of fog (e.g., a fog bank).

NOTE: shallow fog (MIFG), partial fog (PRFG), and patchy fog (BCFG) may be forecast with prevailing visibility of 7 statute miles or greater.

Examples:

TAF
KLWS 020530Z 020606 27010KT 1/2SM FG VV010 BECMG 1011 3SM
BR BKN010 etc.=

This example, for Lewiston-Nez Perce County Airport, shows the proper use of FG (fog) and BR (mist), depending on the associated visibility. Scheduled terminal forecast for Nez Perce County Regional Airport, issued at 0530 UTC on the 2nd day of the month, valid from 0600 UTC on the 2nd until 0600 UTC the next day (the 3rd): Wind from 270 degrees at 10 knots, visibility 1/2 statute mile in fog, vertical visibility 1,000 feet into a surface-based obscuration (ceiling). Change between 1000 and 1100 UTC to visibility 3 statute miles in mist, broken clouds (ceiling) at 1,000 feet.

Examples (continued):

TAF
KPVD 041132Z 041212 27006KT 1/2SM FG VV008 BECMG 1618
30010KT P6SM NSW FEW035
FM0030 18006KT P6SM OVC035 etc.=

This example, for Theodore Francis Green State Airport, shows the proper use of NSW (no significant weather). NSW is only used in BECMG and TEMPO groups, to indicate that the significant weather forecast in an earlier time period is expected to end. In this forecast, fog is forecast from the beginning of the forecast valid period (1200 UTC). Between 1600 and 1800 UTC, the fog is expected to clear, as indicated by NSW in the BECMG 1618 forecast. Note that the FM0030 group does not contain a significant weather group. When significant weather is not expected in a FM group, the significant weather group is omitted.

TAF
KBIL 211140Z 211212 04005KT 1SM -RA BR OVC050 BECMG
1618 3SM -RA BKN050 etc.=

Scheduled terminal forecast for Billings Logan International Airport, issued on the 21st day of the month at 1140 UTC, and valid from 1200 UTC on the 21st until 1200 UTC the next day (the 22nd): Wind from 40 degrees at 5 knots, visibility 1 statute mile in light rain (precipitation) and mist (obscuration), overcast clouds at 5,000 feet. Change is expected between 1600 and 1800 UTC to visibility 3 statute miles in light rain and broken clouds (ceiling) at 5,000 feet.

NOTE: The light rain is repeated in the BECMG group to indicate that light rain remains in the forecast. The mist is omitted from the BECMG 1618 group, which indicates it is forecast to end between 1600 UTC and 1900 UTC.

TAF
KMPV 021130Z 021212 04006KT 3SM -DZ OVC008 BECMG 1719
36010KT P6SM NSW SCT025 etc.=

Scheduled terminal forecast for Edward F. Knapp State Airport, issued on the 2nd day of the month at 1130 UTC, and valid from 1200 UTC on the 2nd until 1200 UTC the next day (the 3rd): Wind from 40 degrees at 6 knots, visibility 3 statute miles in light drizzle, overcast clouds (ceiling) at 800 feet. Improvement between 1700 and 1900 UTC to winds from 360 degrees at 10 knots, visibility greater than 6 statute miles (unrestricted), no significant weather (NSW indicates the drizzle will end during this time period), and scattered clouds at 2,500 feet.

7.2.6.a Vicinity (VC). In the United States, "vicinity" (VC) is defined as an area between circles with radii of 5 and 10 statute miles respectively, from the center of the runway complex of an airport. The international TAF code does not allow forecasts of significant weather beyond the airport (defined as 5 statute miles from the center of the runway complex in the U.S.). However, the FAA requires terminal forecasts to include certain meteorological phenomena which may directly affect flight operations to and from the airport. Therefore, NWS-prepared

terminal forecasts shall include forecasts of fog, showers, and thunderstorm(s) in the airport's vicinity which may directly affect flight operations to and from the airport in the significant weather sections of the terminal forecast describing prevailing conditions (50 percent or greater probability and expected to occur during more than one half of the sub-divided forecast time period). Prevailing conditions are forecast in the initial time period, FM, and BECMG groups. **Significant weather in the vicinity shall not be included in TEMPO or PROB groups.**

The following significant weather phenomena are valid for use in prevailing portions of NWS-prepared terminal forecasts in combination with VC:

phenomenon	coded as
fog*	VCFG
shower(s)**	VCSH
thunderstorm	VCTS

* always coded as "VCFG" regardless of the visibility in the obscuration

** without qualification as to intensity or whether frozen or liquid

Forecast weather in the vicinity should be the last entry in the weather group (w'w') of a particular sub-divided time period of the terminal forecast.

In BECMG or TEMPO groups (see Sections 7.2.9.b and 7.2.9.c, respectively), the abbreviation NSW shall be used in place of w'w' to indicate that weather in the vicinity (e.g., VCSH), which had been included in a previous segment of the terminal forecast is expected to end.

Examples:

TAF
KSPI 050539Z 050606 VRB03KT 1 1/2SM -DZ BR VCSH BKN025
BECMG 1416 P6SM NSW SCT010 BKN025 etc.=

Scheduled terminal forecast for Capital Airport, issued on the 5th day of the month at 0539 UTC, valid from 0600 UTC on the 5th until 0600 UTC the next day (the 6th): Wind direction variable (due to light wind speed), wind speed 3 knots, visibility 1 1/2 statute miles in light drizzle and mist, with showers in the vicinity of the airport, broken clouds (ceiling) at 2,500 feet. Change between 1400 and 1600 UTC to visibility greater than 6 statute miles (unrestricted), no significant weather (NSW, which indicates the light drizzle, mist and fog in the vicinity in the initial time period are all forecast to end between 1400 and 1600 UTC), scattered clouds at 1,000 feet and broken clouds (ceiling) at 2,500 feet. Note wind is not mentioned in the BECMG 1416 group, so it remains VRB03KT.

TAF
KPKB 121738Z 121818 30012KT P6SM VCSH OVC018 BECMG 2224
3SM SHRA SCT020 etc.=

Scheduled terminal forecast, for the Wood County/Gill Robb Wilson Field, issued on the 12th at 1738 UTC, valid from 1800 UTC on the 12th until 1800 UTC the next day (the 13th): Wind from 300 degrees at 12 knots, visibility greater than 6 statute miles (unrestricted), showers in the vicinity of the airport, ceiling overcast at 1800 feet. Change between 2200 and 0000 UTC to visibility 3 statute miles, rain showers (no longer in the vicinity, but occurring within 5 statute miles of the airport) and scattered clouds at 2,000 feet.

7.2.7 Cloud and Obscuration Group. The initial time period and any subsequent FM group(s) shall include a cloud or obscuration group ($N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or SKC), used as appropriate to indicate the cumulative amount ($N_sN_sN_s$) of all cloud layers in ascending order and height ($h_sh_sh_s$); to indicate vertical visibility ($VVh_sh_sh_s$) into a surface-based obscuring medium, or to indicate a clear sky (SKC).

All cloud layers and obscurations shall be considered as opaque, as in the surface observations.

7.2.7.a Cloud Group ($N_sN_sN_sh_sh_sh_s$) or SKC. The cloud group or the contraction SKC shall be used to forecast cloud amount ($N_sN_sN_s$) as follows:

SKY COVER CONTRACTION	SKY COVERAGE
SKC	0 oktas
FEW	> 0 to 2 oktas
SCT	3 to 4 oktas
BKN	5 to 7 oktas
OVC	8 oktas

When a clear sky (0 oktas of cloud amount) is forecast, the cloud group shall be replaced by the contraction SKC. **The contraction CLR, which is used in the METAR code, shall not be used in terminal forecasts**. "CLR" is used in METAR only by automated observing systems to indicate "clear below 12,000 feet AGL". NWS-prepared terminal forecasts for sites with automated observing systems shall contain the cloud amount and/or obscuration(s) that the *forecaster expects*, not just what is expected to be reported by an automated observing system.

Height of cloud ($h_sh_sh_s$) shall be forecast in hundreds of feet AGL at the following resolution:

RANGE OF HEIGHT VALUES (feet)	REPORTABLE INCREMENT (feet)
≤ 3,000	To nearest 100
> 3,000 but ≤ 5,000	To nearest 500
> 5,000	To nearest 1,000

NWS forecasters shall use their judgement (referring to Section 6.7 for guidance) in determining how many $N_sN_sN_sh_sh_sh_s$ groups to include in each sub-divided time period of the terminal forecast. **In general, the number of cloud groups in a particular sub-divided time period should not exceed three.** A third cloud layer above 15,000 feet should not be included if a ceiling of 15,000 feet or less is already in the same forecast group. In other words, broken clouds at 4,000 feet, broken clouds at 12,000 feet and overcast clouds at 25,000 feet should be encoded as BKN040 BKN120.

In addition, scattered cloud layers shall never be forecast above broken or overcast cloud layers and broken cloud layers shall never be forecast above overcast layers.

The lowest level at which the cumulative cloud cover equals 5/8 or more of the celestial dome is understood to be the forecast ceiling. For example, VV020, BKN020 or OVC020, all indicate a 2,000-foot ceiling.

7.2.7.b Obscuration Group ($VVh_sh_sh_s$). The obscuration group ($VVh_sh_sh_s$) is used to forecast vertical visibility, VV, into a surface-based obscuration in hundreds of feet AGL. $VVh_sh_sh_s$ indicates a ceiling at height $h_sh_sh_s$. **NWS-prepared terminal forecasts shall not include forecasts of partial obscurations (i.e., FEW000, SCT000, or BKN000).**

Example:

```
TAF
KCPR 110537Z 110606 24015KT P6SM SKC
     FM0820 24015KT 1SM BR VV008 etc.=
```

Scheduled terminal forecast for Natrona County International Airport, issued on the 11th of the month at 0537 UTC and valid from 0600 UTC on the 11th until 0600 UTC on the next day (the 12th): Wind from 240 degrees at 15 knots, visibility greater than 6 statute miles (unrestricted), clear skies. Significant change at 0820 UTC to wind from 240 degrees at 15 knots, visibility 1 statute mile in mist, vertical visibility (ceiling) 800 feet into a surface-based obscuration. Note that the wind in the FM group is the same as in the initial forecast period, but is repeated since all elements are required to be included in a FM group.

7.2.7.c Cloud Type. The only cloud type included in the terminal forecast is cumulonimbus (CB); when appropriate, the contraction CB follows cloud or obscuration height ($h_sh_sh_s$) without a space.

Cumulonimbus may be included in the cloud forecast group ($N_sN_sN_sh_sh_sh_s$) or the obscuration group ($VVh_sh_sh_s$) without mentioning thunderstorm in the significant weather group (w'w'). On the other hand, however, the cloud or obscuration group shall include a forecast cloud type of cumulonimbus (CB) whenever thunderstorm is included in the significant weather group. This is true even if the thunderstorm is only forecast to be in the vicinity (VCTS). Similarly, there may be situations where nearly identical cloud or obscuration group(s) appear in consecutive time periods, with the only difference being the addition or elimination of the forecast cloud type (cumulonimbus).

Examples:

```
TAF
KORD 110537Z 110606 06008KT P6SM FEW050 SCT100
     FM1115 11010KT 2SM -RA OVC012 etc.=
```

Scheduled terminal forecast for Chicago O'Hare International Airport, issued on the 11th day of the month at 0537 UTC and valid from 0600 UTC on the 11th until 0600 UTC the next day (the 12th): Winds from 60 degrees at 8 knots, visibility greater than 6 statute miles (unrestricted), few clouds at 5,000 feet and scattered clouds at 10,000 feet. Significant change at 1115 UTC to winds from 110 degrees at 10 knots, visibility 2 statute miles in light rain, overcast clouds (ceiling) at 1,200 feet. Note the initial forecast period (beginning at 0600 UTC) does not contain a significant weather group. When significant weather is not expected in the initial period of a FM group, the significant weather group is omitted.

```
TAF
KDAY 221730Z 221818 19010G25KT P6SM BKN040
     FM2230 26025G45KT 1/2SM TSSN OVC010CB etc.=
```

Scheduled terminal forecast for James M. Cox Dayton International Airport, issued on the 22nd day of the month at 1730 UTC and valid from 1800 UTC on the 22nd until 1800 UTC the next day (the 23rd): Wind from 190 degrees at 10 knots gusting to 25 knots, visibility greater than 6 statute miles (unrestricted), broken clouds (ceiling) at 4,000 feet. Significant change at 2230 UTC to wind from 260 degrees at 25 knots gusting to 45 knots, visibility 1/2 statute mile in a thunderstorm with moderate snow, overcast clouds (ceiling) at 1,000 feet, including cumulonimbus.

```
TAF
KUNV 101131Z 101212 30015G25KT P6SM VCTS OVC015CB
      BECMG 1415 NSW OVC015=
```

Scheduled terminal forecast for University Park Airport, issued on the 10th day of the month at 1131 UTC, valid from 1200 UTC on the 10th until 1200 UTC the next day (the 11th): Wind from 300 degrees at 15 knots gusting to 25 knots, visibility greater than 6 statute miles (unrestricted), thunderstorms in the vicinity of the airport, overcast cumulonimbus clouds (ceiling) at 1,500 feet. Change between 1400 and 1500 UTC to no significant weather (thunderstorms in the vicinity will end or move beyond 10 statute miles of the center of the runway complex) and overcast clouds (ceiling) at 1,500 feet. Note that the cloud forecast is repeated in the BECMG 1415 group to eliminate the cumulonimbus, even though there is no change in the forecast height nor amount. Also, since no other elements are mentioned in the BECMG 1415 group, the wind and visibility remain as forecast in the initial forecast period.

Examples (continued):

```
TAF
KSYR 230532Z 230606 29012KT 1/2SM SHSN FZFG OVC003
      TEMPO 0609 29014G28KT 1/4SM +TSSNPE BLSN VV001CB
     FM1400 36011KT P6SM FEW008 BKN025 BECMG 2224 VRB03KT
      SKC=
```

Scheduled terminal forecast for Syracuse Hancock International Airport, issued on the 23rd day of the month at 0532 UTC and valid from 0600 UTC on the 23rd until 0600 UTC the next day (the 24th): Wind from 290 degrees at 12 knots, visibility 1/2 statute mile in moderate snow showers and freezing fog, overcast clouds (ceiling) at 300 feet. Temporarily between 0600 and 0900 UTC, wind from 290 degrees at 14 knots gusting to 28 knots, visibility 1/4 statute mile in a thunderstorm with heavy snow and ice pellets, and blowing snow, vertical visibility 100 feet into a surface-based obscuration (ceiling) composed of cumulonimbus (CB was appended to the vertical visibility due to the presence of thunder). NOTE: the "+" qualifier is associated with the precipitation snow ("SN") and ice pellets ("PE") and **not** the thunderstorm ("TS"). Significant change at 1400 UTC to wind from 360 degrees at 11 knots, visibility greater than 6 statute miles (unrestricted), few clouds at 800 feet. Change between 2200 UTC and 0000 UTC to variable wind direction (here due to light winds), wind speed 3 knots, and clear skies.

7.2.8 Non-Convective Low-Level Wind Shear Group (WSh$_{ws}$h$_{ws}$h$_{ws}$/dddffKT). Wind shear is defined in NOAA Technical Memorandum NWS FCST-23, "Low-Level Wind Shear: A Critical Review", by Julius Badner, NWS Meteorological Services Division, April 1979, reprinted February 1989, as "...a change in horizontal wind speed, and/or direction, and/or vertical speed with distance measured in a horizontal and/or vertical direction." Wind shear is a **vector difference**, composed of wind direction and wind speed, between two wind velocities. A sufficient difference in wind speed, or wind direction, or both, can have a negative impact on airplanes, especially within 2,000 feet of the ground.

The following paragraph emphasizing the importance of wind shear is taken from ICAO Circular 186-AN/122, entitled Wind Shear, published in 1987:

> "Wind shear cannot be calculated by simple scalar subtraction of the wind speeds, except in the specific case where the directions of the two winds concerned are exactly the same or are exact reciprocals. ...The scalar shear (i.e. direct subtraction of wind speeds taking no account of their directions) is always less than or equal to the vector shear and thus for most cases underestimates the actual shear magnitude."

Forecasters may use NOAA Technical Memorandum NWS FCST-23, "Low-Level Wind Shear: A Critical Review", as a reference for non-convective low-level wind shear forecasting. The procedures described below are based on that study.

Forecasts of wind shear in the terminal forecast shall refer only to non-convective wind shear up to and including 2,000 feet of the ground and shall be included in terminal forecasts, on an as needed basis, to focus the attention of the pilot on non-convective wind shear problems, existing or expected. Non-convective low-level wind shear may be associated with the following: frontal passage, inversion, low-level jet, lee side of mountain effects, sea breeze front, Santa Ana winds, etc.

Non-convective low-level wind shear forecasts (indicated by WS) shall be included in the terminal forecast, when expected, as the last group (i.e., after the cloud forecast) in the initial forecast period or in a FM group. Once included in the forecast, the wind shear group remains the prevailing condition until the next FM group or the end of the forecast valid period if there are no subsequent FM groups. **Forecasts of non-convective low-level wind shear shall not be included in BECMG (see Section 7.2.9.b), TEMPO (see Section 7.2.9.c), or PROB (see Section 7.2.9.d) groups.**

The format of the non-convective low-level wind shear group is:

$WSh_{ws}h_{ws}h_{ws}$/dddffKT, where:

WS	=	an indicator for non-convective low-level wind shear;
$h_{ws}h_{ws}h_{ws}$	=	height of the wind shear, in hundreds of feet (AGL);
ddd	=	true direction, in multiples of ten degrees, of the wind above the indicated height; see Note below
ff	=	speed, in knots, of the forecast wind above the indicated height; and
KT	=	a units indicator, meaning knots

NOTE: **VRB shall not be used in the non-convective low-level wind shear forecast group.**

Example:

```
TAF
KPUB 181122Z 181212 17012G22KT P6SM SCT020 OVC060 TEMPO 1416 3SM -TSRA
      OVC020CB
     FM1600 17015G25KT 5SM -SHRA SCT015 OVC040
     FM1800 27015KT 5SM -RA SCT010 OVC035 WS020/27035KT BECMG 1820 2SM
      -SHRA OVC010
     FM2100 27015G25KT P6SM SCT020 OVC035 BECMG 0103 32015KT OVC030
      TEMPO 0105 5SM -SHRA=
```

Scheduled terminal forecast for Pueblo Memorial Airport, issued on the 18th of the month at 1122 UTC and valid from 1200 UTC on the 18th until 1200 UTC on the next day (the 19th): Wind from 170 degrees at 12 knots gusting to 22 knots, visibility greater than 6 statute miles (unrestricted), scattered clouds at 2,000 feet, overcast clouds (ceiling) at 6,000 feet. Temporarily between 1400 and 1600 UTC, visibility 3 statute miles in thunderstorms with light rain, and overcast clouds (ceiling), including cumulonimbus, at 2,000 feet. Significant change at 1600 UTC: wind from 170 degrees at 15 knots gusting to 25 knots, visibility 5 statute miles, light rain showers, scattered clouds at 1500 feet, and overcast clouds (ceiling) at 4,000 feet. Significant change at 1800 UTC: wind from 270 degrees at 15 knots, visibility 5 statute miles, light rain, scattered clouds at 1,000 feet, overcast clouds (ceiling) at 3,500 feet, non-convective low-level wind shear at 2,000 feet, wind from 270 degrees at 35 knots. Change between 1800 and 2000 UTC, visibility 2 statute miles in light rain showers, overcast clouds (ceiling) at 1,000 feet. Significant change at 2100 UTC: wind from 270 degrees at 15 knots gusting to 25 knots, visibility greater than 6 statute miles (unrestricted), scattered clouds at 2,000 feet, overcast clouds (ceiling) at 3,500 feet. Change between 0100 and 0300 UTC: winds from 320 degrees at 15 knots, overcast clouds (ceiling) at 3,000 feet. Temporarily between 0100 and 0500 UTC, visibility 5 statute miles in light rain showers.

In this forecast, the wind shear is a prevailing condition from 1800 UTC until the beginning of the next FM group (2100 UTC).

The WS group is not included in the international standard for the TAF code, FM 51-X Ext. TAF, which is documented in the WMO Manual on Codes, WMO No. 306, Volume I.1, Part A. However, the North American countries have agreed to provide it in terminal forecasts, based on national coding practices (see Section 2). The WS group may appear in a different order within terminal forecasts prepared by other U.S. government agencies or other North American countries, but the coding and interpretation of the WS group by all countries in North America is the same as described in this section. For example, in Canadian terminal forecasts, the WS group may appear immediately following the surface wind forecast ($dddffGf_mf_mKT$); in U.S. military terminal forecasts, the WS group may follow the lowest surface pressure group ($QNHP_IP_IP_IP_IINS$), which is not used in NWS-prepared forecasts (see Appendix G for a description of the QNH group).

A non-convective low-level wind shear forecast shall be included in the initial time period or a FM group in a terminal forecast whenever:

a. one or more PIREPs of non-convective wind shear within 2,000 feet of the surface, at or in the vicinity of the terminal forecast airport, causing an indicated air speed loss or gain of 20 knots or more are received, **and** the forecaster determines that the report(s) reflect a valid non-convective low-level wind shear event rather than mechanical turbulence due to strong surface winds; **and/or**

b. when vertical non-convective wind shears (vector difference) of 10 knots or more per 100 feet in a layer more than 200 feet thick are expected or reliably reported within 2,000 feet of the surface at, or in the vicinity of, the airport (see referenced Technical Memorandum NWS FCST-23, page 21, Table 3 -- Wind Shear Computation Table).

If meteorological conditions are such that non-convective low-level wind shear of intensities similar to those described above are expected and/or could be inferred from less detailed PIREPs or other sources, the forecaster should include a WS group in the initial time period or a FM group of the terminal forecast.

Other possible tools for detecting or observing non-convective low-level wind shear in the short-term are the Velocity Azimuth Display (VAD) wind profiles from the WSR-88D, data from the wind profiler network (where available), and data from FAA’s Terminal Doppler Weather Radars (where available). The utility of these data sets, of course, depends on the proximity of the sensors to the airport for which terminal forecasts are written and the elevation of the sensors. Mountain top WSR-88D radars will not be useful for detecting non-convective low-level wind shear within 2,000 feet of the ground.

7.2.9 Forecast Change Indicators. Forecast change indicators are contractions which shall be used to sub-divide the forecast period (24-hours for scheduled terminal forecasts; less for amended or delayed forecasts) according to **significant** changes in the weather (refer to Section 6.7).

The intent of the guidelines in the following sections is to define the forecast change indicators and the probability group, and thereby enable the forecaster to fully convey expected weather conditions accurately, consistently, and concisely so that the pilot can make the go or no-go decision.

Forecasters are encouraged to sub-divide the valid period of the terminal forecast using FMGGgg (see Section 7.2.9.a) as often as possible rather than the other forecast change indicators. The reasoning for this is that a FMGGgg forecast group is a more definitive and precise forecast, which is more useful to the customer. **BECMG, TEMPO, and PROB groups should be used sparingly in NWS-prepared terminal forecasts**.

A FMGGgg forecast group (see Section 7.2.9.a) indicates a change at a specific point in time in hours and minutes (GGgg), and includes a complete set of prevailing conditions beginning at the indicated time. Both FMGGgg and BECMG GGG_eG_e (see Section 7.2.9.b) are used to forecast changes to prevailing conditions. The changes described by FMGGgg occur quickly (in less than one hour); changes forecast in a BECMG GGG_eG_e group occur more gradually during a **window** of time (GGG_eG_e), never more than two hours in length in NWS-prepared terminal forecasts. Having the two options, FMGGgg to describe a rapid change, and BECMG GGG_eGe to describe a more gradual change, gives the forecaster a way to clearly convey his or her thinking on the timing of the changes to the customer.

To keep the forecast intent clear and unambiguous to the aviation customer, forecast groups should be as concise as possible, describing only significant changes which may potentially affect aviation operations. Overlapping of sub-divided forecast valid periods should be avoided. Additionally, **no more than a total of two consecutive BECMG, TEMPO and/or PROB groups, shall be used during the initial forecast period or following any subsequent FM group(s).**

Conditions described in BECMG, TEMPO, and PROB groups must be considered by the forecaster in determining whether a specific update criterion has been met. Forecasters should keep in mind that the FAA requires that TEMPO and PROB groups, as well as FM and BECMG groups, be considered by pilots and dispatchers in determining allowable destinations, alternates, and required fuel loads. This makes the content of BECMG, TEMPO, and PROB groups operationally more significant than FM groups when they describe lower conditions. This is one reason that BECMG, TEMPO, and PROB groups should be used sparingly.

For example, a forecast of "TEMPO 0507 3SM RA BR OVC015" would require the pilot to file an IFR alternate and carry additional fuel. A forecast of "TEMPO 2302 2SM -FZDZ BR VV005" would, in most cases, preclude an airport from being used as an IFR alternate. A more extreme case would be a forecast such as

"PROB30 1923 1/4SM TSRA OVC005CB." The visibility of 1/4 statute mile could, in some circumstances, preclude the airport from being used as a destination by an air carrier.

The following forecast change indicators shall be used when a change in any or all of the elements forecast is expected:

7.2.9.a FMGGgg. The time-divider group TTGGgg in the form FMGGgg (voiced as "from") shall be used to indicate when **prevailing conditions** are expected to change significantly, over less than one hour, to a different set of prevailing conditions. In such instances, the forecast shall be sub-divided into time periods using the contraction "FM", followed, without a space, by four digits indicating the time (in hours and minutes, UTC) the change is expected to occur. **Note that time used with a FM group is a four-digit time, coded in hours and minutes.** While the use of a four-digit time in whole hours (e.g. 2300 UTC) is acceptable, if a forecaster can predict changes and/or events with higher resolution, more precise timing of the change, to the minute (e.g., 2315 UTC), should be indicated. All forecast elements following FMGGgg shall relate to the period of time from the indicated time (GGgg) to the end of the valid period of the terminal forecast, or to the next FMGGgg or BECMG GGG_eG_e if the terminal forecast valid period is divided into additional periods.

The sub-divided time period shall be a complete description of the weather (i.e., self-contained) and all forecast conditions given before the FMGGgg group are superseded by those following the group. **All elements of the terminal forecast (surface wind, visibility, significant weather, clouds and obscurations, and, when expected, non-convective low-level wind shear) shall be included in each FM group(s), with one exception: if significant weather is not expected in the period covered by the FM group, significant weather is omitted**. All elements shall be included in each FM group even if a particular element is forecast to remain unchanged from the previous time period. For example, if forecast cloud and visibility changes warrant the inclusion of a new FM group but the wind is not forecast to change, the new FM group shall include a wind forecast, even if it is the same as the most recently forecast wind.

There may be one or more FM groups, depending on the prevailing weather conditions expected. In the interest of clarity, each FM group shall start on a new line of forecast text, indented five spaces.

AVIATION TERMINAL FORECASTS (D-31)

Examples:

```
TAF
KDSM 022336Z 030024 20015KT P6SM BKN015
     FM0230 29020G35KT 1SM +SHRA OVC005 TEMPO 0507 1/4SM
      +SHSN
     FM1200 31010G20KT P6SM SCT025=
```

Scheduled terminal forecast for Des Moines International Airport, issued on the 2nd day of the month at 2336 UTC and valid from 0000 UTC on the 3rd until 0000 UTC the next day (the 4th): Wind from 200 degrees at 15 knots, visibility greater than 6 statute miles (unrestricted), broken clouds (ceiling) at 1,500 feet. Significant change at 0230 UTC to wind from 290 degrees at 20 knots gusting to 35 knots, visibility 1 statute mile in heavy rain showers, overcast clouds (ceiling) at 500 feet. Temporarily between 0500 and 0700 UTC, visibility will decrease to 1/4 statute mile in heavy snow showers. Significant change at 1200 UTC to wind from 310 degrees at 10 knots gusting to 20 knots, visibility greater than 6 miles (unrestricted), scattered clouds at 2,500 feet.

Note that significant weather is omitted from the initial forecast period, beginning at 0000 UTC. Significant weather is omitted from the initial time period or a FM group when none is expected. Significant weather is also omitted from the FM1200 time period, which indicates two things: first, that the heavy rain showers forecast to begin at 0230 UTC will end at 1200 UTC; second, that significant weather is not expected between 1200 and 0000 UTC (the remainder of the forecast valid period).

```
TAF
KAPN 312330Z 010024 13008KT P6SM SCT030
     FM0320 31010KT 3SM -SHSN BKN015
     FM0500 31010KT 1/4SM +SHSN VV007=
```

Scheduled terminal forecast for Alpena County Regional Airport, issued on the 31st day of the month at 2330 UTC, valid from 0000 UTC on the 1st until 0000 UTC on the next day (the 2nd): Wind from 130 degrees at 8 knots, visibility greater than 6 statute miles (unrestricted), scattered clouds at 3,000 feet. Significant change at 0320 UTC to wind from 310 degrees at 10 knots, visibility 3 statute miles in light snow showers, broken clouds (ceiling) at 1,500 feet. Significant change at 0500 UTC to wind from 310 degrees at 10 knots, visibility 1/4 statute mile in heavy snow showers, vertical visibility 700 feet into a surface-based obscuration (ceiling). Note that the wind in the FM0500 group is the same as in the previous FM group, but is repeated since all elements are required to be included in a FM group.

7.2.9.b BECMG GGG_eG_e. The change-indicator group TTTTT GGG_eG_e in the form BECMG GGG_eG_e (voiced as "becoming") shall be used to indicate a change to forecast **prevailing conditions** expected to occur at either a regular or irregular rate at an unspecified time within the period GG to G_eG_e. Note that the change occurs during a period of time defined by a two-digit beginning time, in whole hours UTC, and a two-digit ending time, also in whole

hours UTC. **The duration of the change period covered by BECMG indicated by GGG_eG_e shall never exceed 2 hours in an NWS-prepared terminal forecast.** The conditions forecast in a BECMG group remain in effect, beyond the end of the defined period of change (G_eG_e), until the next FM or BECMG group, or to the end of the terminal forecast.

The BECMG group shall be followed by a description of the elements for which a change is forecast. An element for which no change is forecast during the period GG to G_eG_e shall be omitted from the BECMG group and shall be understood to remain as in the portion of the terminal forecast preceding GG. Only the weather elements which are forecast to change need to be included in the BECMG group. However, when a significant reduction in visibility is forecast to occur in a BECMG group, the significant weather causing the deterioration shall also be included. If a significant change is expected in the cloud forecast, all cloud layers, including any significant layer(s) not expected to change, shall be given.

In response to feedback from aviation customers, and because of the need for concise and definitive forecasts, the use of BECMG groups should be kept to a minimum. Forecasts sub-divided by FM groups are much preferred by aviation customers, because a specific time of the expected change(s) to conditions is indicated, and all elements are included in FM groups, making the terminal forecast easier to interpret. Since changes described with BECMG occur over the period of a couple of hours, and since the FAA interprets BECMG groups for dispatch purposes very conservatively, the lowest conditions in the BECMG group are controlling. This restricts the operations of aviation customers, and at times, necessitates filing an alternate flight plan or carrying extra fuel.

To better serve our customers, no more than a total of two consecutive BECMG, TEMPO, and/or PROB groups shall be used during the initial forecast period or following any subsequent FM group(s). In addition, forecasters should avoid using a BECMG group to forecast minimum prevailing conditions, especially visibility less than 1/2 statute mile.

Non-convective low-level wind shear groups ($WSh_{ws}h_{ws}h_{ws}$/dddffKT) shall not be included in BECMG groups.

Examples:

```
TAF
KDFW 220539Z 220606 21010KT 3SM BR SCT030 BECMG
      1012 1SM TSRA BR OVC010CB
     FM1830 etc.=
```

Scheduled terminal forecast for Dallas/Fort Worth International Airport, issued on the 22nd day of the month at 0539 UTC and valid from 0600 UTC on the 22nd until 0600 UTC the next day (the 23rd): Wind from 210 degrees at 10 knots, visibility 3 statute miles in mist, scattered clouds at 3,000 feet. Change between 1000 and 1200 UTC to visibility 1 statute mile in thunderstorms with moderate rain and mist, overcast clouds (ceiling), including cumulonimbus, at 1,000 feet. Note the change described in the BECMG group occurs at an unspecified time, and at an unspecified rate, between 1000 and 1200 UTC and those conditions persist until the next FM or BECMG group (which begins at 1830 UTC). Also note that the mist is repeated in the BECMG 1012 group, since it, along with the thunderstorm with moderate rain, is restricting the visibility.

```
TAF
KHOU 092340Z 100024 22007KT P6SM SCT040 BKN100
      BECMG 0204 16012KT 5SM HZ SCT040 OVC200=
```

Scheduled terminal forecast for William P. Hobby Airport, issued on the 9th day of the month at 2340 UTC, and valid from 0000 UTC on the 10th until 0000 UTC the next day (the 11th): Wind from 220 degrees at 7 knots, visibility greater than 6 statute miles (unrestricted), scattered clouds at 4,000 feet, broken clouds (ceiling) at 10,000 feet. Change between 0200 and 0400 UTC to wind from 160 degrees at 12 knots, visibility 5 statute miles in haze, scattered clouds at 4,000 feet and overcast clouds (ceiling) at 20,000 feet.

7.2.9.c TEMPO GGG_eG_e. The change-indicator group TTTTT GGG_eG_e in the form TEMPO GGG_eG_e shall be used to indicate temporary fluctuations to forecast meteorological conditions which are expected to:

1) have a high percentage (50 percent or greater) probability of occurrence, **and**,
2) last for one hour or less in each instance, **and**,
3) in the aggregate, to cover less than half of the period GG to G_eG_e

Note that the temporary changes described by a TEMPO group(s) occurs during a period of time defined by a two-digit beginning time, in whole hours UTC, and a two-digit ending time, also in whole hours UTC. If the temporary condition is expected to last more than 1 hour, a FMGGgg or BECMG GGG_eG_e group should be used to forecast conditions different from those forecast prior to GG. If the temporary forecast condition is expected to cover, in the aggregate, more than half of the period GG to G_eG_e, then the temporary condition should be considered to be a predominant

feature of the forecast and should be entered in the initial forecast period or following a FM, BECMG, or TEMPO group. **In general, the period of time covered by a TEMPO group should not exceed four hours.**

The TEMPO group shall be followed by a description of all the elements for which a temporary change is forecast. An element for which no temporary change is forecast during the period GG to G_eG_e shall be understood to remain as in the portion of the terminal forecast preceding GG. Only the weather elements which are forecast to temporarily change need to be included in the TEMPO group. However, when a significant reduction in visibility is forecast to change in a TEMPO group, the significant weather causing the deterioration shall also be included. If a significant change is expected in the cloud forecast, all cloud layers, including any significant layer(s) not expected to change shall be given.

No more than a total of two consecutive TEMPO, BECMG, and/or PROB groups shall be used during the initial forecast period or following any subsequent FM group(s).

TEMPO groups shall not include forecasts of either significant weather in the vicinity (VC) or non-convective low-level wind shear ($WSh_{ws}h_{ws}h_{ws}$/dddffKT).

Examples:

TAF
KDDC 221130Z 221212 29010G25KT P6SM SCT025 TEMPO 1820
1 1/2SM SHRA BKN010 etc.=

Scheduled terminal forecast for Dodge City Regional Airport, issued on the 22nd day of the month at 1130 UTC, and valid from 1200 UTC on the 22nd until 1200 UTC the next day (the 23rd): Wind from 290 degrees at 10 knots gusting to 25 knots, visibility greater than 6 statute miles (unrestricted), scattered clouds at 2,500 feet. Temporarily between 1800 and 2000 UTC, visibility 1 1/2 statute miles in moderate rain showers, and broken clouds (ceiling) at 1,000 feet.

Examples (continued):

TAF
KSEA 091125Z 091212 19008KT P6SM SCT010 BKN020 OVC090 TEMPO
1215 -RA SCT010 BKN015 OVC040=

Scheduled terminal forecast for Seattle-Tacoma International Airport issued on the 9th day of the month at 1125 UTC and valid from 1200 UTC on the 9th until 1200 UTC the next day (the 10th): Wind from 190 degrees at 8 knots, visibility greater than 6 statute miles (unrestricted), scattered clouds at 1,000 feet, broken clouds (ceiling) at 2,000 feet, overcast clouds at 9,000 feet. Temporarily between 1200 UTC and 1500 UTC, the forecast is for light rain, scattered clouds at 1,000 feet, broken clouds (ceiling) at 1,500 feet, and overcast clouds at 4,000 feet. Note that in the TEMPO 1215 group, all three cloud layers are included, even though the lowest layer is not forecast to change from the initial time period.

TAF
KBOI 091735Z 091818 24007KT P6SM SCT025 BKN040 TEMPO 1822
-SHSN BKN025 BKN040=

Scheduled terminal forecast for Boise Air Terminal/Gowen Field issued on the 9th day of the month at 1735 UTC and valid from 1800 UTC on the 9th until 1800 UTC the next day (the 10th): Wind from 240 degrees at 7 knots, visibility greater than 6 statute miles (unrestricted), scattered clouds at 2,500 feet, broken clouds (ceiling) at 4,000 feet. Temporarily between 1800 and 2200 UTC, light snow showers, broken clouds (ceiling) at 2,500 feet, and broken clouds at 4,000 feet. Note that in the TEMPO 1822 group, the two cloud layers are repeated from the initial time period, because of the addition of the significant weather group (-SHSN).

7.2.9.d PROBC_2C_2 GGG_eG_e. The probability group PROBC_2C_2 GGG_eG_e shall be used by NWS offices **only to forecast a low probability occurrence (30 or 40 percent chance) of a thunderstorm (and associated precipitation) or precipitation event**, along with associated weather and obscuration elements (wind, visibility and/or sky condition) whose occurrences are directly related to, and contemporaneous with, the thunderstorm or precipitation event.

The PROBC_2C_2 group states the forecaster's assessment of the probability of occurrence of the weather event that follows it. PROB shall be followed by two digits, giving probability in percent (either 30 or 40), and by a space and four digits (GGG_eG_e) giving the beginning and ending hours of the time period during which the forecast condition is expected. PROB30 and PROB40 are the only PROB groups to be used in NWS-prepared terminal forecasts.

If the probability of the thunderstorm or precipitation event is expected to equal or exceed 50 percent, then that event should be considered to be a predominant feature of the forecast and should be entered in the initial forecast period or following a FM, BECMG, or TEMPO group of the terminal forecast.

The PROBC_2C_2 group shall not be used in the first six hours of the valid period of the terminal forecast. Additionally, the period of time covered by a PROBC_2C_2 forecast group should generally be six hours or less, excluding widespread or self-sustaining convective systems.

No more than a total of two consecutive PROB, BECMG, and/or TEMPO groups shall be used during the initial forecast period or following any subsequent FM group(s).

The decision to use PROBC_2C_2 in a terminal forecast should be based on the fact that the terminal forecast is limited to a 5 statute mile radius around the airport terminal. This is a significantly smaller area than the zone covered by the corresponding public forecast. The 6- or 12-hour area probability of precipitation (PoP) guidance and the forecaster's hourly expectations of actual occurrence at a terminal forecast site can vary over relatively short periods of time but should be synoptically consistent with the public forecast.

PROB groups shall not include forecasts of significant weather in the vicinity (VC) or non-convective low-level wind shear (WSh$_{ws}$h$_{ws}$h$_{ws}$/dddffKT).

The PROBC_2C_2 group shall not be used by NWS offices as a direct modifier of a BECMG or TEMPO or with a FM group. (WMO TAF regulations allow the use of PROB30 or PROB40 in combination with the TEMPO group, for example, PROB30 TEMPO 1214; refer to Appendix G, Section 1.3). Similarly, BECMG and TEMPO groups may not be used by NWS offices as a direct modifier of the PROB group e.g., BECMG PROB40 2324. The reason for these prohibitions is to ensure the terminal forecast is as easy as possible to understand and correctly interpret.

8. Unscheduled Forecasts. Unscheduled terminal forecasts are issued on an as-needed basis as amended, delayed, or corrected messages. They contain the same elements and use the same format as scheduled issuances except for different date and time of forecast origin (YYGGgg) and different beginning valid times (for amended and delayed forecasts only). The entire text of each individual terminal forecast, not just the amended, corrected, or delayed portion, shall be transmitted.

Amended, delayed, and corrected forecasts shall include the appropriate "BBB" group in the WMO abbreviated heading. Amended, delayed, and corrected forecasts are counted ("lettered") independently. For example, the first correction to a scheduled forecast would be "CCA". If that same corrected forecast needed to be amended, the amendment would be "AAA", indicating it is the first amendment of the scheduled forecast, etc. The following table demonstrates the procedures for multiple combinations of corrected, amended and delayed forecasts:

TIME (UTC)	**FORECAST ISSUED**	**"BBB" INDICATOR**
0530 UTC	scheduled terminal forecast (NIL)	none
0615 UTC	first delayed terminal forecast	RRA
0714 UTC	first amendment to terminal forecast	AAA
1042 UTC	second amendment to terminal forecast	AAB
1045 UTC	first correction to terminal forecast	CCA

8.1 Amended Forecasts. NWS offices that prepare terminal forecasts shall keep the current weather and forecasts under continuous review to ensure that necessary terminal forecast amendments are issued promptly. Terminal forecasts should be amended whenever they become, in the forecaster’s judgement, unrepresentative of existing or expected conditions, particularly regarding those elements and events detailed in Appendix H. Forecasters should strive to amend terminal forecasts prior to the occurrence of changes that meet these criteria. Amendments shall be issued promptly whenever conditions meeting one or more of the criteria occur, and in the forecaster’s judgement, will persist. At a minimum, forecasters shall amend terminal forecasts based on the amendment criteria listed in Appendix H. Forecasters should also refer to Appendix C, Section 3 (Amendment Criteria) and Section 4 (Amendment Philosophy). The amendment criteria apply to both manual and automated observing sites.

Amendments shall be issued when expected or observed conditions: 1) meet amendment criteria for the specified forecast elements, 2) are expected to persist, **and** 3) in the forecaster’s judgement, there is sufficient, reliable information, **using the total observation concept,** on which to base a forecast. If this third test is not met, an amendment stating "NIL" shall be issued. Forecasters may amend any portion of a terminal forecast for an unattended part-time site when there is sufficient information to

determine that a criterion has been met or that the forecast for that element has become unrepresentative of actual conditions.

An amended terminal forecast should be considered in situations where a TEMPO group has been used and the forecaster determines that (1) the actual probability of occurrence is, and will remain, less than 50 percent; or (2) the occurring TEMPO conditions will account for one half or more of the forecast group's valid period.

An amended terminal forecast shall be identified in the WMO abbreviated heading by the contraction AAx following the date-time group, where x is the letter A through X, as described in Section 7.1. For example, AAA would indicate the first amendment of a particular scheduled terminal forecast, AAB, the second amendment of the same scheduled forecast, etc. An amended forecast shall also be identified by TAF AMD (in place of TAF) on the first line of the forecast text.

The international requirement states that the date-time group in the WMO abbreviated heading of an amended terminal forecast shall be the same as that of the original terminal forecast being amended. **NWS offices not using AFOS equipment** to prepare nor transmit terminal forecasts are required to prepare amended terminal forecasts which meet the international requirement, as shown in the non-AFOS example below.

At NWS offices using AFOS, due to software limitations, the forecaster is not required to manually enter the time of the original terminal forecast into the WMO abbreviated heading of an amended forecast. The forecaster may elect to allow AFOS to automatically "time-stamp" the date-time group in the WMO abbreviated heading with the actual time the amendment is transmitted, as shown in the AFOS examples below. The NWSTG will assign the proper time to the amended terminal forecast when it builds the appropriate collective(s), in order to meet the international requirement.

The amended forecast shall cover all of the remaining valid period of the original scheduled forecast. Expired portions of the forecast being amended or references to weather occurring before the issuance time shall be omitted from the amendment.

In an amended forecast, the date and time of the forecast origin group (YYGGggZ) shall reflect the time the amended forecast was prepared. In the forecast valid period group ($Y_1Y_1G_1G_1G_2G_2$), the first four digits ($Y_1Y_1G_1G_1$) shall reflect the UTC date and time of the beginning of the period of validity of the amended

terminal forecast. With an *issuance time* (YYGGggZ) of H+00 to H+29, use the current hour (based on UTC) to denote the beginning *valid time* ($Y_1Y_1G_1G_1G_2G_2$); for H+30 to H+59, use the next hour (based on UTC). In either case the forecast shall be valid from the time of forecast origin (YYGGgg) to the valid period ending time of the original scheduled terminal forecast.

non-AFOS Example of amended terminal forecast:

Original

```
                    Amended
FTAK31 PANC 030500
   FTAK31 PANC 030500 AAA
TAF
                    TAF AMD
PAEN 030540Z 030606 etc.=              PAEN 031012Z 031006 etc.=
```

The *scheduled* forecast, for Kenai Municipal Airport, was prepared and transmitted by a non-AFOS office. The date-time group in the WMO abbreviated heading of the *scheduled* terminal forecast indicates the time of the full hour (0500 UTC) preceding the transmission of the forecast. The scheduled forecast was prepared at 0540 UTC on the 3rd day of the month (shown in the date-time of forecast origin in the forecast text of the *scheduled* forecast) and transmitted between 0500 and 0600 UTC (shown in the date/time group in the WMO abbreviated heading). Four and one-half hours later, the forecaster prepared the *first amendment* to that forecast (indicated by "AAA"), at 1012 UTC on the 3rd day of the month. The amended terminal forecast shows the time of the original scheduled forecast in the WMO abbreviated header (0500 UTC), as specified in the international requirements.

(optional) AFOS Example of amended terminal forecast:

Original
```
PDXTAFPDX
TTAA00 KPDX 101124
TAF
KPDX 101123Z 101212 32004KT P6SM SCT100
      FM1500 32009KT P6SM SCT050 TEMPO 1519 BKN050
      FM2200 33005KT P6SM SKC BECMG 0002 00000KT=
```

Amended
```
PDXTAFPDX
TTAA00 KPDX 101441 AAA
TAF AMD
KPDX 101440Z 101512 30006KT P6SM BKN030 TEMPO 1517 SCT030
      FM1700 32009KT P6SM SCT050 TEMPO 1721 BKN050
      FM2200 33005KT P6SM SKC BECMG 0002 00000KT=
```

The *scheduled* terminal forecast, for Portland International Airport, was prepared and/or transmitted using AFOS equipment, and the forecaster opted to allow AFOS to "time-stamp" the forecast in the WMO abbreviated heading. The *scheduled* forecast was prepared at 1123 UTC on the 10th day of the month (shown in the date-time of forecast origin in the forecast text, and typed in by the forecaster) and transmitted at 1124 UTC (shown in the date/time group in the WMO abbreviated heading, "time-stamped" automatically by AFOS). Three hours later, the forecast was *amended* for the first time (indicated by "AAA") at 1440 UTC (typed in by the forecaster) and "time-stamped" automatically by AFOS (in the WMO abbreviated header) at 1441 UTC.

The *amended* forecast is valid from 1500 UTC on the 10th until 1200 UTC on the next day (the 11th). Note the initial time period forecast of the *scheduled* issuance (valid from 1200 UTC until 1500 UTC) has been omitted from the amendment.

To summarize, the only parameters regarding times that change in an *amended* terminal forecast are:

1) date-time of forecast origin (YYGGgg) in the forecast text of the terminal forecast, and
2) the beginning of the forecast valid period group ($Y_1Y_1G_1G_1G_2G_2$) in the forecast text of the terminal forecast, and
3) (at NWS offices using AFOS only): the date/time group in the WMO abbreviated heading, and
4) expired portions of the forecast being amended or references to weather occurring before the issuance time shall be omitted from the amendment

Instructions on issuing a correction to an amended forecast are included in Section 8.3.1. Also refer to the table shown in Section 8.

8.2 Delayed Forecasts. Delayed forecasts shall be issued as

soon as possible after (1) correction of the problem (electrical, mechanical or other) that caused the delay or, for sites with part-time manual or part-time augmented automated observations, (2) resumption of observations (two consecutive observations not less than 30 minutes nor more than about one hour apart).

A delayed terminal forecast shall be identified in the WMO abbreviated heading by the contraction RRx following the date-time group, where x is the letter A through X, as described in Section 7.1. For example, RRA would indicate the first delayed issuance of a particular scheduled forecast. Only offices issuing terminal forecasts in collectives would need to issue a second (or greater) delayed terminal forecast. **There is no contraction in the forecast text to indicate that a forecast is delayed; the contraction RRx only appears in the WMO abbreviated heading line.**

The international requirement states that the date-time group in the WMO abbreviated heading of a delayed terminal forecast shall be the same as that of the original scheduled terminal forecast. NWS offices **not using AFOS** equipment to prepare or transmit terminal forecasts are required to prepare delayed terminal forecasts which meet the international requirement, as shown in the non-AFOS example below.

At NWS offices using AFOS, due to software limitations, the forecaster is not required to manually enter the time of the original terminal forecast into the WMO abbreviated heading of a delayed forecast. The forecaster may elect to allow AFOS to "time-stamp" the date-time group in the WMO abbreviated heading with the actual time the delayed terminal forecast is transmitted, as shown in the AFOS examples shown below. The NWSTG will assign the proper time to the delayed terminal forecast when it builds the appropriate collective(s), in order to meet the international requirement.

The delayed forecast is valid from the UTC date and time of actual forecast origin (YYGGggZ) until the end of the previously scheduled terminal forecast valid period. The date and time of actual forecast origin (YYGGggZ) should be determined by the UTC date and time of the issuance of the delayed forecast. With an *issuance* time of H+00 to H+29, use the current hour (based on UTC) to denote the beginning *valid* time ($Y_1Y_1G_1G_1G_2G_2$); for H+30 to H+59, use the next hour (based on UTC). The forecast shall be valid from the time of forecast origin (YYGGgg) to the valid period ending time of the original scheduled terminal forecast.

non-AFOS example of delayed terminal forecast:

```
Original
                    Delayed
FTPA31 PHNL 030500
   FTPA31 PHNL 030500 RRA
TAF
                    TAF
PHMK 030540Z 030606 NIL=                PHMK 031012Z 031006 etc.=
```

The *scheduled* forecast, for Molokai Airport, was prepared and transmitted by a non-AFOS office. The date-time group in the WMO abbreviated heading of the *scheduled* terminal forecast indicates the time of the full hour 0500 UTC, preceding the transmission of the forecast. The forecast was prepared at 0540 UTC on the 3rd day of the month (as shown in the date-time of forecast origin in the forecast text of the *scheduled* forecast) and transmitted between 0500 and 0600 UTC (as shown in the date/time group in the WMO abbreviated heading). Four and one-half hours later, the forecaster prepared the first *delayed* forecast (indicated by "RRA"), at 1012 UTC on the 3rd day of the month (as shown in the date-time of forecast origin in the forecast text of the terminal forecast). The *delayed* terminal shows the time of the original scheduled forecast in the WMO abbreviated header (0500 UTC), as required internationally.

(optional) AFOS example of delayed terminal forecast:

```
Original
                    Delayed
SEATAFSEA
                    SEATAFSEA
TTAA00 KSEA 170541
      TTAA00 KSEA 170641 RRA
TAF
                                        TAF
KSEA 170540Z 170606 NIL=
   KSEA 170641Z 170706 etc.=
```

The *scheduled* terminal forecast, for Seattle-Tacoma International Airport, was prepared and/or transmitted using AFOS equipment, and the forecaster opted to allow AFOS to "time-stamp" the forecast in the WMO abbreviated heading. The *scheduled* terminal forecast was prepared at 0540 UTC on the 17th day of the month (as shown in the date-time of forecast origin in the forecast text of the terminal forecast, and typed in by the forecaster) and transmitted at 0541 UTC (as shown in the date/time group in the WMO abbreviated heading, and "time-stamped" automatically by AFOS). One hour later, the forecaster prepared the first *delayed* forecast (indicated by "RRA") at 0641 UTC on the 17th day of the month (typed in by the forecaster). The *delayed* terminal forecast was automatically "time-stamped" by AFOS in the WMO abbreviated header at 0641 UTC.

8.3 Corrected Forecasts. Corrected forecasts shall be issued as soon as possible after discovery of an error (typographical or other mistake). A corrected terminal forecast shall be identified in the WMO abbreviated heading by the contraction CCx following the date-time group, where x is the letter A through X,

as described in Section 7.1. For example, CCA would indicate the first correction of a particular scheduled forecast, CCB the second correction of the same scheduled forecast, etc. **There is no contraction in the forecast text to indicate that a forecast is corrected; the contraction CCx only appears in the WMO abbreviated heading.**

The international requirement states that the date-time group in the WMO abbreviated heading of a corrected terminal forecast shall be the same as that of the original scheduled terminal forecast. For NWS offices **not using AFOS** equipment to prepare/ transmit terminal forecasts, the date-time group in the WMO abbreviated heading of a corrected terminal forecast shall be the same as that of the original terminal forecast **unless the date-time group in the WMO abbreviated header contained the error.** Refer to the non-AFOS example below.

At NWS offices using AFOS, the forecaster is not required to manually enter the time of the original terminal forecast into the WMO abbreviated heading of a corrected forecast, due to AFOS software limitations. The forecaster may elect to allow AFOS to "time-stamp" the date-time group in the WMO abbreviated heading with the actual time the corrected terminal forecast is transmitted, as shown in the AFOS example shown below. The NWSTG will assign the proper time to the corrected terminal forecast when it builds the appropriate collective(s), in order to meet the international requirement.

The date-time group of actual forecast origin (YYGGggZ) in the forecast text of the terminal forecast shall reflect the time the corrected forecast was prepared, and is typed in by the forecaster. The forecast valid period ($Y_1Y_1G_1G_1G_2G_2$) of a corrected forecast shall be the same as that of the original terminal forecast issuance unless the valid period contained the error.

non-AFOS example of corrected terminal forecast :

Original
Corrected

```
FTAK31 PAFA 030500                    FTAK31 PAFA 030500 CCA
TAF                                   TAF
PAOM 030540Z 030606 etc.=             PAOM 030551Z 030606 etc.=
```

The *scheduled* forecast, for Nome Airport, was prepared and transmitted by a non-AFOS office. The date-time group in the WMO abbreviated heading of the *scheduled* terminal forecast indicates the time of the full hour, in UTC (0500 UTC), preceding the transmission of the

forecast, as required internationally. The *scheduled* forecast was prepared at 0540 UTC on the 3rd day of the month (as shown in the date-time of forecast origin in the forecast text of the terminal forecast) and transmitted between 0500 and 0600 UTC (as shown in the date/time group in the WMO abbreviated heading). Eleven minutes later, the forecaster discovered an error and prepared the first *corrected* forecast (indicated by "CCA"), at 0551 UTC on the 3rd day of the month (typed in by the forecaster). The *corrected* terminal forecast shows the time of the original scheduled forecast in the WMO abbreviated header (0500 UTC), as required internationally.

(optional) AFOS example of corrected terminal forecast:

Original

Corrected

```
MSPTAFDLH                                   MSPTAFDLH
TTAA00 KDLH 170532
     TTAA00 KDLH 170630 CCB
TAF
                                            TAF
KDLH 170530Z 170606 etc.=
   KDLH 170629Z 170606 etc.=
```

The *scheduled* terminal forecast, for Duluth International Airport, was prepared and/or transmitted using AFOS equipment, and the forecaster opted to allow AFOS to "time-stamp" the forecast in the WMO abbreviated heading. The *scheduled* terminal forecast was prepared at 0530 UTC on the 17th day of the month (as shown in the date-time of forecast origin in the forecast text of the terminal forecast, and typed in by the forecaster) and transmitted at 0532 UTC (as shown in the date/time group in the WMO abbreviated heading, and "time-stamped" automatically by AFOS). Some time later, the forecaster discovered an error and prepared the first correction ("CCA", which is not shown here). Roughly an hour after the scheduled terminal forecast was sent, the forecaster discovered another error and prepared and transmitted a *second correction* (indicated by "CCB") at 0629 UTC on the 17th day of the month (as shown in the date-time of forecast origin in the forecast text of the terminal forecast, typed in by the forecaster). The *second corrected terminal forecast* was automatically "time-stamped" by AFOS in the WMO abbreviated header at 0630 UTC.

The corrected terminal forecast shall consist of the entire original terminal forecast (having corrected the error(s)) and **shall cover the entire original valid period**. This is true even if the correction is transmitted hours into the valid period and part of the forecast has expired.

Complete example of corrected terminal forecast:
(AFOS and non-AFOS offices shall follow similar procedures)

Original

```
CLETAFCLE
TTAA00 KCLE 170535
TAF
KCLE 092330Z 100024 P6SM BKN060 TEMPO 0004 -SHRA OVC030 etc.=
```

Corrected

```
CLETAFCLE
TTAA00 KCLE 170218 CCA
TAF
KCLE 100215Z 100024 19008KT P6SM BKN060 TEMPO 0004 -SHRA OVC030 etc.=
```

The *corrected terminal forecast* shown above was issued more than two hours after the scheduled forecast. The valid time of the *corrected* forecast remains the same as it was in the *scheduled* forecast, from 0000 UTC on the 10th until 0000 UTC on the 11th. Also, the TEMPO 0004 time period remains the same in the correction as it was in the scheduled forecast, even though the correction was prepared at 0215Z.

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8.3.1 Correcting Amended or Delayed Forecasts. If an amended or delayed forecast contains an error, it should be corrected following the same procedures described earlier in Section 8.3. An example of a corrected amendment is shown below:

Example of corrected amendment:
(AFOS and non-AFOS offices shall follow similar procedures)

Amendment (containing an error)
```
TOPTAFMHK
TTAA00 KTOP 271524 AAA
TAF AMD
KMHK 271522Z 271512 VRB03KT P6SM SCT012 TEMPO 1517 BKN012
     FM1700 11000KT P6SM SCT035
     FM0100 10003KT P6SM SKC BECMG 0810 3SM BR=
```

Corrected amendment
```
TOPTAFMHK
TTAA00 KTOP 271604 CCA
TAF AMD
KMHK 271602Z 271512 VRB03KT P6SM SCT012 TEMPO 1517 BKN012
     FM1700 11005KT P6SM SCT035
     FM0100 10003KT P6SM SKC BECMG 0810 3SM BR=
```

The *amended* terminal forecast for Manhattan Municipal Airport was prepared on the 27th day of the month at 1522 UTC (as shown in the date-time of forecast origin in the forecast text of the amended terminal forecast), and valid from 1500 UTC on the 27th until 1200 UTC the next day (the 28th). The amendment contains an error in the FM1700 group: winds incorrectly encoded as 110 degrees at 00 knots. The forecaster notices the error, and prepares the first *correction* ("CCA") of the terminal forecast at 1602 UTC (as shown in the date-time of forecast origin in the forecast text of the corrected terminal forecast). Note the following in the *corrected amendment*: 1) the "CCA" replaces the "AAA" in the WMO abbreviated heading which appeared in the first amendment; 2) the first line of the forecast text remains "TAF AMD"; 3) the forecast valid period ($Y_1Y_1G_1G_1G_2G_2$) in the forecast text is the same as the original amendment (1500 UTC - 1200 UTC); 4) the error in the FM1700 group has been corrected.

9. Severe Weather Watch (WW). A severe thunderstorm is defined as a thunderstorm accompanied by wind gusts of 50 knots or more and/or hail (surface or aloft) 3/4 inch or more in diameter. The SPC issues local severe storm watches (WWs) for tornadoes and severe thunderstorms for the contiguous United States. SPC also issues the Severe Weather Outlook (AC). Both of these products should receive strong consideration in preparing or amending terminal forecasts. However, the forecaster should apply them in the same fashion as any other guidance information. Forecasting the occurrence of any phenomenon at a specific terminal requires the analysis of information from all available sources.

This means that terminal forecasts may vary from WWs and ACs to

the extent that the forecaster expects conditions at an airport to differ from those over a more generalized area. This approach allows forecasters to avoid forecasting thunderstorms at a single site (point) for long time periods. Issuance of a WW or an AC does not, in itself, require an amendment for an airport in the watch or outlook area.

In the terminal forecast, there is no way to explicitly forecast a severe thunderstorm in the significant weather group. However, a severe thunderstorm may be indicated in a terminal forecast on the basis of the strength of the winds (including wind gusts of 50 knots or greater *and* a thunderstorm in significant weather). There is no significant weather code for 3/4 inch hail or larger, which is the hail criteria for a severe thunderstorm.

Generally, tornadoes, waterspouts, and funnel clouds should not be included in terminal forecasts because the probability of occurrence at a specific site is extremely small.

10. Records Retention. Records of disseminated terminal forecasts, including amendments, corrections, and delayed issuances, shall be maintained as called for by WSOM Chapter D-90, Weather Support for Accident Investigations and Litigation, and associated OMLs and ROMLs.

11 Verification of Terminal Forecasts. For details on terminal forecast verification, see WSOM Chapter C-73, Public/Aviation Forecast Verification, and associated OMLs and ROMLs.